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DEPARTMENT OF THE ARMY FIELD MANUAL

FIELD ARTILLERY BATTERY SERGEANT

HEADQUARTERS, DEPARTMENT OF THE ARMY
APRIL 1966

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FIELD MANUAL
No. 6–38

HEADQUARTERS
DEPARTMENT OF THE ARMY
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FIELD ARTILLERY BATTERY, SERGEANT

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*This manual supersedes FM 6–38, 2 March 1964.

CHAPTER 1

GENERAL

1. Purpose and Scope

a. This manual is a guide to assist commanders in training the personnel of a Sergeant firing battery to become an efficient, smooth-working, disciplined team that will function effectively in combat. This manual prescribes the duties of personnel, section drills, methods of inspection and maintenance, methods of decontamination and destruction, safety precautions, training, and tests for qualification of missilemen.

b. The material presented herein is applicable without modification to both nuclear and nonnuclear warfare.

c. Drills prescribed in this manual cover the duties of individuals in emplacement, testing, assembly, disassembly, and march order.

d. Tables I through V are at the end of the manual. Tables I through IV are fold-ins, and table V is a nomograph for the effective rocket motor temperature.

e. This manual applies to the Sergeant firing battery.

f. Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be submitted on DA Form 1598 (Record of Comments on Publications) and should be keyed to the specific page, paragraph, and line of text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded directly to the Commandant, U. S. Army Artillery and Missile School, ATTN: AKPSIAS–PL, Fort Sill, Okla. 73503.

2. Terms and Definitions

a. Azimuth orientation system (AOS) – An integrated group of components that includes the azimuth orientation unit (AOU), the reference theodolite (RT), the traverse target (TT), and the missile orientation target (MOT).

b. Couple – To attach the lunette or kingpin of a trailer or semitrailer to the pintle or the fifth wheel of a prime mover, connect all brake and light cables, and retract the landing gear.

c. Firing set (FS) – The component that initiates and monitors the signals necessary to the countdown and to condition and fire the missile. It consists of an inclosure, electronic assemblies, and associated cabling. It is located on the front of the launching station.

d. Gas turbine generator set (GTGS) – A gas turbine generator set that is mounted on both the launching station and the organizational maintenance test station to provide the necessary electrical power for operations. The gas turbine generator sets are interchangeable.

e. Launching station (LS) – A semitrailer consisting of four major assemblies – the zero length launcher, the azimuth orientation system, the gas turbine generator set, and the firing set – used to assemble, prepare, and fire the missile.

f. Organizational maintenance test station (OMTS) – A specially designed van mounted on a semitrailer and used to test the missile sections.

g. Orientation.

(1) *Front* – The end of all trailer or semitrailer-mounted equipment that is coupled to the prime mover. The front of the missile in the horizontal position is the end of the missile in the direction in which the missile points.

(2) *Right (left)* – The direction right (left) when standing to the rear and facing to the front of the equipment or the missile.

h. Sergeant missile–The assembled missile which consists of four principal missile sections, as follows:

(1) A warhead section.
(2) A guidance section.
(3) A rocket motor section.
(4) Four control surface assemblies.

i. Special ammunition load (SAL) – The specific quantity of special ammunition to be carried by a delivery unit.

j. Transporter.

(1) *Motor guidance transport trailer (MGTT)* – A specially designed semitrailer used to transport the missile guidance section, the rocket motor section, and four control surface assemblies.

(2) *Warhead section transporter* – A general purpose 2½-ton cargo truck equipped and used to transport a warhead section in a container.

k. Uncouple – To detach the lunette or kingpin of a trailer or semitrailer from the pintle or the fifth wheel of a prime mover, disconnect all brake and light cables, and extend the landing gear.

3. References

References pertaining to the Sergeant missile and associated equipment and covering related matters not discussed in detail in this manual are listed in the appendix.

CHAPTER 2

ORGANIZATION

4. Composition of the Sergeant Firing Battery

The firing battery (fig. 1) consists of a battery headquarters, a detail platoon, and a firing platoon.

a. Battery Headquarters. The battery headquarters is responsible for administration, mess, supply, and maintenance within the fire battery. The responsibilities are comparable to those of similar units.

b. Detail Platoon. The detail platoon consists of a platoon headquarters, a communication section, and a survey section.

(1) *Platoon headquarters.* The platoon headquarters consists of the platoon commander and the platoon sergeant.

(2) *Communication section.* The communication section is responsible for wire and radio communication for the battery.

(3) *Survey section.* The survey section provides the necessary survey action control at the firing positions of the battery.

c. Firing Platoon. The firing platoon consists of a platoon headquarters, a firing section, a missile test section, and an ammunition section.

(1) *Platoon headquarters.* The functions of the firing platoon headquarters are as follows:

(*a*) Training and proficiency of personnel.

(*b*) Performance of duties in section drill, preparation for action and traveling, firing, and inspection and maintenance for all platoon equipment.

(*c*) Security of warhead sections and missiles transported by the ammunition section.

(*d*) Observation of safety precautions.

(*e*) Preparation of field fortifications for protection of personnel and equipment.

(*f*) Maintenance of records on the missile and support equipment as specified in appropriate technical manuals.

(*g*) Operation of communication networks within the firing platoon.

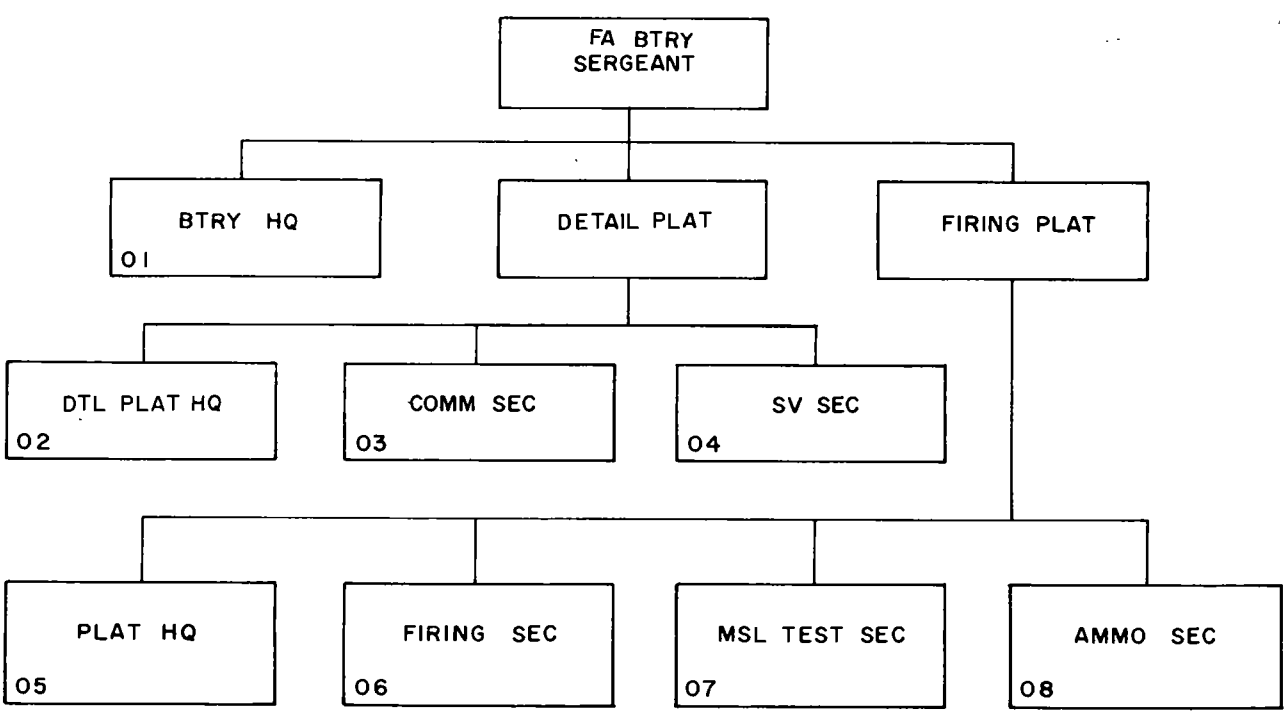


Figure 1. Field artillery battery, Sergeant.

(*h*) Assistance in the selection of the firing positions.

(2) *Firing section.* The functions of the firing section are to prepare the firing position, emplace the launching station, assemble the missile, conduct self-test of the firing set, orient the missile, monitor the automatic countdown, and perform the organizational maintenance on the launching station.

(3) *Missile test section.* The functions of the missile test section are to emplace and operate the organizational maintenance test station, test the guidance section and control surface assemblies, and perform organizational maintenance on the organizational maintenance test station and missiles.

(4) *Ammunition section.* The functions of the ammunition section are to draw (if directed by battalion), transport, and store the missiles and to perform organizational maintenance on missile transport equipment and containers.

5. General Duties of Personnel

a. Personnel.

(1) The duties of personnel in the battery headquarters and battery detail are not described in this manual, since they are comparable to those of other field artillery batteries and are described in detail in appropriate field and technical manuals.

(2) The duties of the platoon personnel are covered in *b* through *g* below.

b. Platoon Commander. The platoon commander has the same inherent responsibilities as the commanders of other field artillery firing platoons. Particular attention must be given to maintenance, training, and security, due to the complexity of the equipment within the platoon.

c. Missile Assembly Technician. The missile assembly technician monitors and coordinates the technical operations of the three sections of the platoon. He monitors the maintenance performed by the crew and coordinates this maintenance with the next higher level. He must also be qualified to replace the platoon commander.

d. Platoon Sergeant. The platoon sergeant is the noncommissioned officer in charge of the firing platoon. He coordinates platoon operations and assists the platoon commander in performing his duties.

e. Firing Section Personnel.

(1) *Chief of the firing section.* The chief of the firing section is responsible to the platoon commander for the –

(*a*) Training and efficiency of firing section personnel.

(*b*) Performance of duties in section drill emplacement, preparation for firing and traveling, missile assembly, and inspection and maintenance of all section equipment.

(*c*) Observance of safety precautions and the decontamination of equipment and materiel within the section.

(*d*) Preparation of field fortifications for protection of personnel and equipment.

(*e*) Camouflage discipline; local security; chemical, biological, and radiological (CBR) discipline; and security discipline.

(2) *Assistant chief of the firing section.* The assistant chief of section assists the chief of section in performing the duties described in (1) above. His specific duties pertain to supervision of assembly and disassembly of the missile. He performs other duties as prescribed by the chief of the firing section.

(3) *Boom operator.* The boom operator operates the launching station superstructure during assembly and disassembly of the missile as listed in chapter 3 and in TM 9–1440–301–12.

(4) *Firing set operator.* The firing set operator operates the firing set during the automatic self-test and countdown. See chapter 3 and TM 9–1440–301–12 for operator procedures.

(5) *Senior AOS operator.* The senior AOS (azimuth orientation system) operator emplaces and employs the azimuth orientation unit for orienting the Sergeant missile. He must be proficient in maintenance of the azimuth orientation unit. Care and use of the AOS equipment are outlined in chapter 3 and in TM 5–6675–233–15.

(6) *AOS operator.* The AOS operator assists the senior AOS operator in performing his

duties and operates the reference theodolite.

(7) *Numbered crewmen and drivers.* The numbered crewmen and drivers perform duties as prescribed in tables I through IV and as directed by the chief of section. Section drivers perform operator maintenance on assigned vehicles.

f. Missile Test Section Personnel.

(1) *Chief of the missile test section.* The chief of the missile test section is responsible to the platoon commander for the –

(*a*) Training and efficiency of the missile test section crewmen.

(*b*) Performance of duties in section drill, preparation for missile section tests, missile checkout, preparation for travel, and inspection and maintenance of all section equipment.

(*c*) Performance of all other duties of the chief of firing section as listed in *e*(1)(c) and (*e*) above for section personnel.

(2) *Senior test station operator and test station operators.* The senior test station operator and the test station operators perform duties on the organizational maintenance test station (OMTS) and the missile sections as prescribed in chapter 4 and in TM 5–4120–222–15, TM 5–6115–294–12, TM 5–6115–320–12, TM 9–1410–302–20, and TM 9–4935–303–12, and other duties as prescribed by the chief of section.

g. Ammunition section personnel.

(1) *Chief of the ammunition section.* The chief of the ammunition section is responsible to the platoon commander for the –

(*a*) Handling and delivery of ammunition to the missile test and firing sections, as required. Security of the ammunition is a primary duty and responsibility that requires constant alertness on the part of the chief of section.

(*b*) Performance of all other duties of the chief of firing section as listed in *e*(1)(*c*), (*d*), and (*e*) above for section personnel.

(2) *Truck drivers.* The truck drivers perform operator maintenance on their vehicles, utilizing the appropriate vehicle manual, and perform other duties prescribed by the chief of section.

(3) *Numbered crewmen.* The numbered crewmen of the ammunition section act as assistant drivers and assist the assigned drivers in performing maintenance on the vehicles. The crewmen perform maintenance on the ammunition containers and perform other duties prescribed by the chief of section.

CHAPTER 3

PREPARING FOR ACTION AND TRAVELING

6. General

Both the firing platoon and the battery detail are involved in preparing for action.

a. Survey. The battery or battalion survey section will extend survey to the firing position. This action normally will be performed prior to the arrival of the launching station in the area. The survey team will use the procedures, techniques, and specifications set forth in FM 6–37 and unit SOP's. A detailed discussion of survey planning is contained in FM 6–2.

b. Communication. The battery communication section will install both wire and radio communications within the battery area as prescribed by unit SOP's. The duties of the communication section are discussed in detail in FM 6–10 and FM 6–37.

c. Firing Section. The firing section emplaces the launcher and notifies the ammunition section to deliver the ammunition to be fired.

d. Missile Test Section. The missile test section emplaces the organizational maintenance test station and notifies the ammunition section to deliver untested guidance sections and control surface assemblies to the Organizational Maintenance Test Station.

e. Ammunition Section. The ammunition section physically checks and prepares to deliver ammunition as requested.

7. Launching Station

a. General. The selected firing position should be prepared prior to occupation. A level area is preferable, but the launching station may be emplaced on a slope not exceeding a grade of 1 in 10 (100 mils).

b. Firing Position. The firing position includes the firing point and approaches and is approximately 150 meters wide (perpendicular to the launching station centerline) and 18 meters long (parallel to the launching station centerline). This cleared area includes space on the right and left of the launching station for the missile section transporters, boom traverse, and missile orientation. This area should include at least one good approach and exit. If the cleared area has only one approach, the width of that area should be doubled to allow the transporters to turn around.

c. Ground Conditions for the Launching Station. If it is necessary to position the launching station on loose or soft soil, it may be necessary to reinforce the soil under the jack pads to prevent settling. However, this can be determined only through experience gained from training under varying field conditions.

d. Launching Station Settling. The weight of the missile and motions of the superstructure may cause the launching station to settle. Therefore, the level of the launching station must be checked after the missile has been assembled.

e. Prime Mover. The prime mover is a 5-ton tractor. The prime mover is used to tow the launching station to its position in the most expeditious manner consistent with proper camouflage. The assistant chief of section directs the driver of the prime mover to the desired position and halts the vehicle. Hand signals for guiding the driver are contained in FM 21–60.

8. Procedures for Launching Station Emplacement

The duties of firing section personnel in emplacing the launching station and the sequence in which they are performed are given in table I.

9. Preparation for Missile Assembly

a. As the launching station is being emplaced and leveled, the missile section transporters are brought forward and positioned as shown in figures 2 and 3. The missile sections are assembled into a complete missile on the launching station boom.

b. For instructions on missile assembly, see table II and figure 4. The assistant chief of section is responsible for all hand signals during the assembly of the missile except emergency stops, which

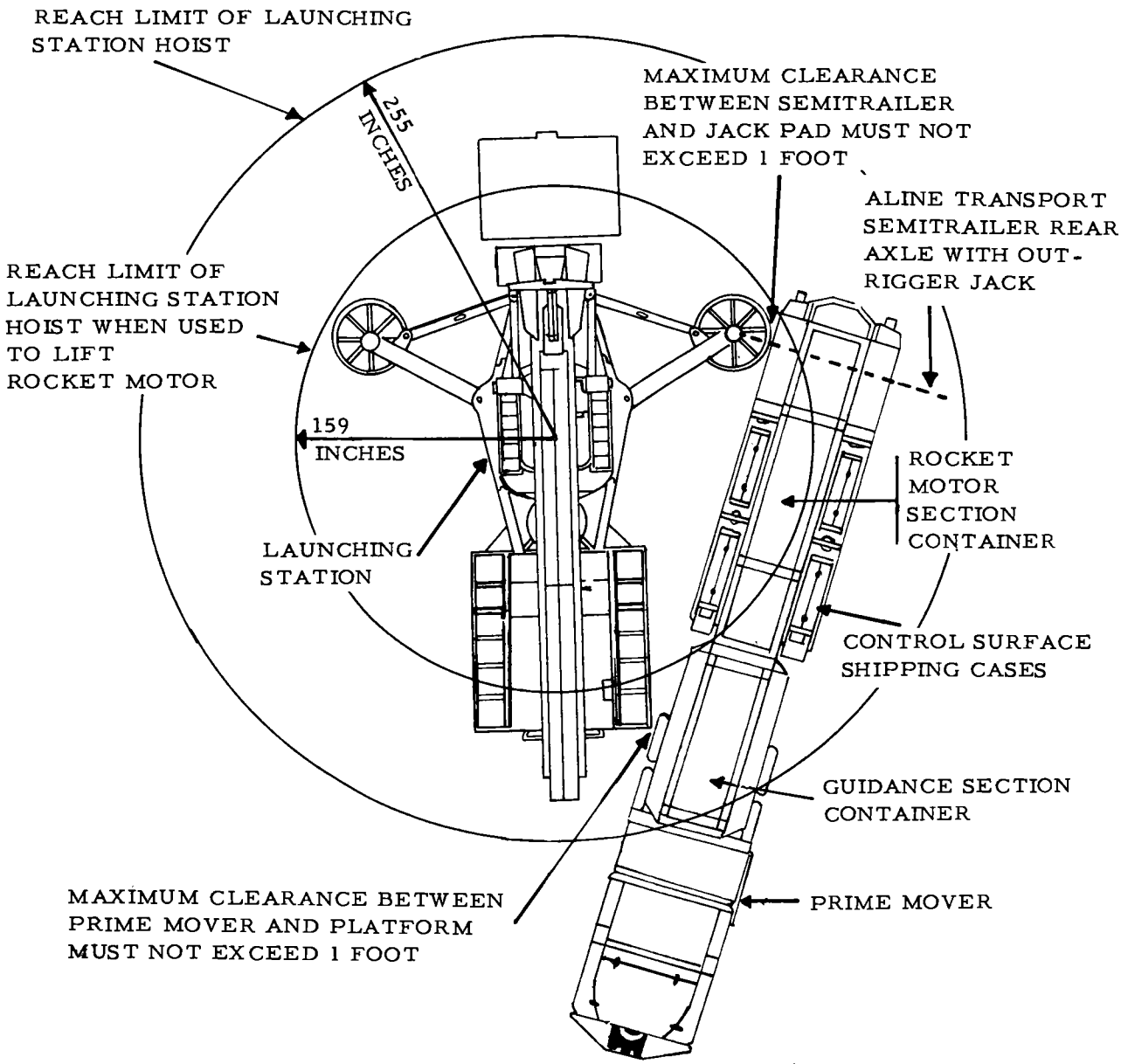


Figure 2. Positioning the rocket motor and guidance section transporter.

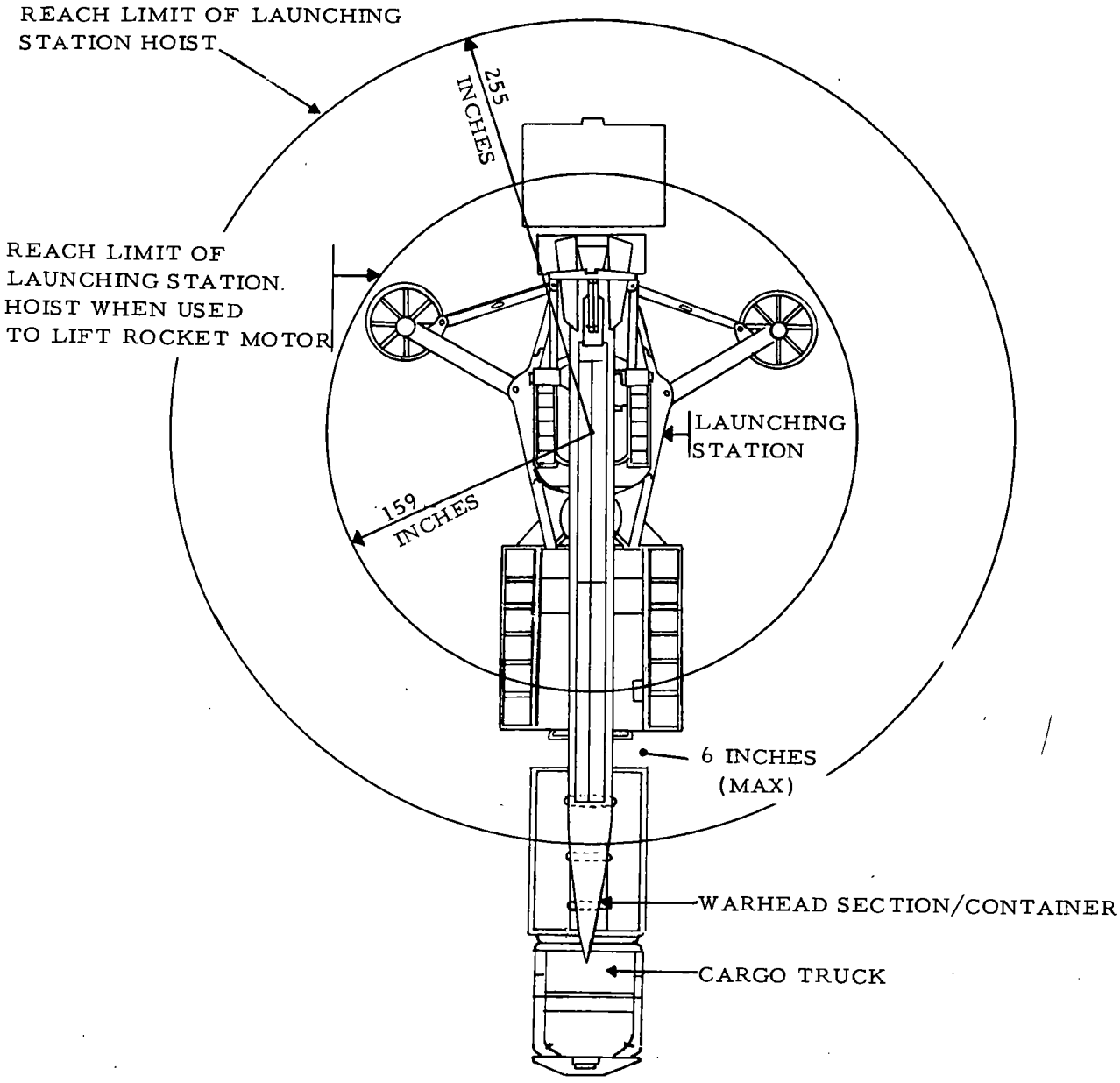


Figure 3. Positioning the warhead section transporter.

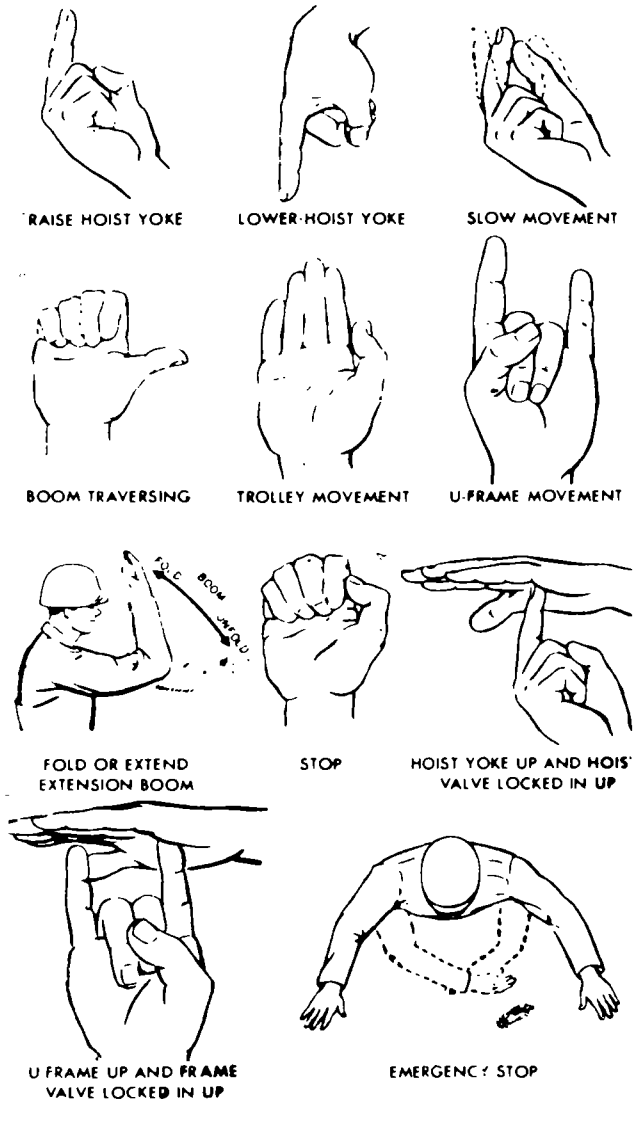


Figure 4. Missile assembly and disassembly hand signals.

any crewman may give. This will insure that the operation is completed in as short a time as possible, commensurate with safe operating conditions for personnel and equipment.

10. Emplacement of Azimuth Orientation System Equipment

a. There are two azimuth orientation system (AOS) operators in the firing section. The senior AOS operator is responsible for the operation of the azimuth orientation unit (AOU) on the launching station, and the AOS operator is responsible for the operation of the reference theodolite figs. 5 and 6).

b. The AOS operator emplaces the reference theodolite and the traverse target. He then plumbs and levels the reference theodolite over the primary reference stake and the traverse target over the secondary reference stake.

c. The senior AOS operator emplaces and levels the azimuth orientation unit. He checks with the assistant chief of section to see that the launching station is level.

d. The AOS operator may at this time, using A_1 as the starting azimuth, determine A_2, A_3, and A_m. The senior AOS operator transmits the values of A_m and A_1 to the firing set (FS) operator and chief of section (CS) and records the values of A_1, A_2, and A_m on the AOS data form. Refer to figure 6 and table I.

e. In performing the operations in *b* through *d* above, the AOS operator should follow the detailed instruction in TM 9–1440–301–12.

11. Missile Assembly

When the launching station has been emplaced and leveled and A_m has been determined, the launching station is ready for missile assembly.

a. A method of positioning the motor guidance transport trailer (MGTT) is shown in figure 2.

b. For safety, the warhead section transporter is not positioned until the rocket motor section has been engaged with the boom and the HOOKS ENGAGED YES indicator lamp has lighted. The warhead section transporter can be moved into position as shown in figure 3.

c. Missile assembly may be accomplished by using table II, figures 4 and 7 through 13, and TM 9–1440–301–12.

d. The chief of section furnishes the rocket motor temperatures to the firing set operator as soon as they are obtained.

(1) The chief of section (or a designated crewman) and the firing set operator, using a nomograph (table V) or the formula below, compute the effective motor temperature parameter prior to the start of the countdown.

$A = K_1 T_c + K_2 T_A$

Q = effective temperature.

$K_1 = 0.84$ (a constant).

$K_2 = 0.16$ (a constant).

T_c = cavity (motor nozzle) temperature.

T_A = aft body (tail fairing) temperature.

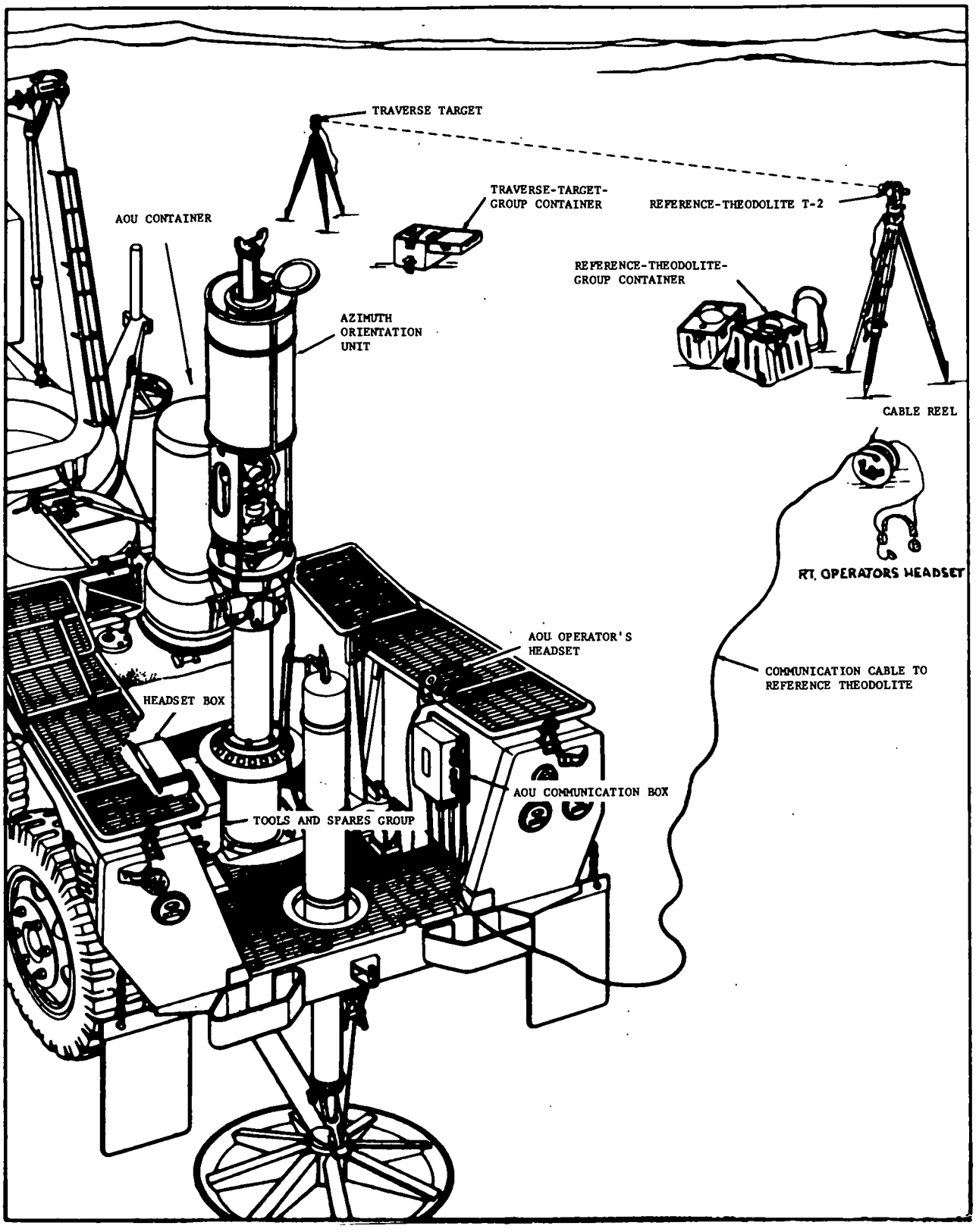


Figure 5. Azimuth orientation equipment.

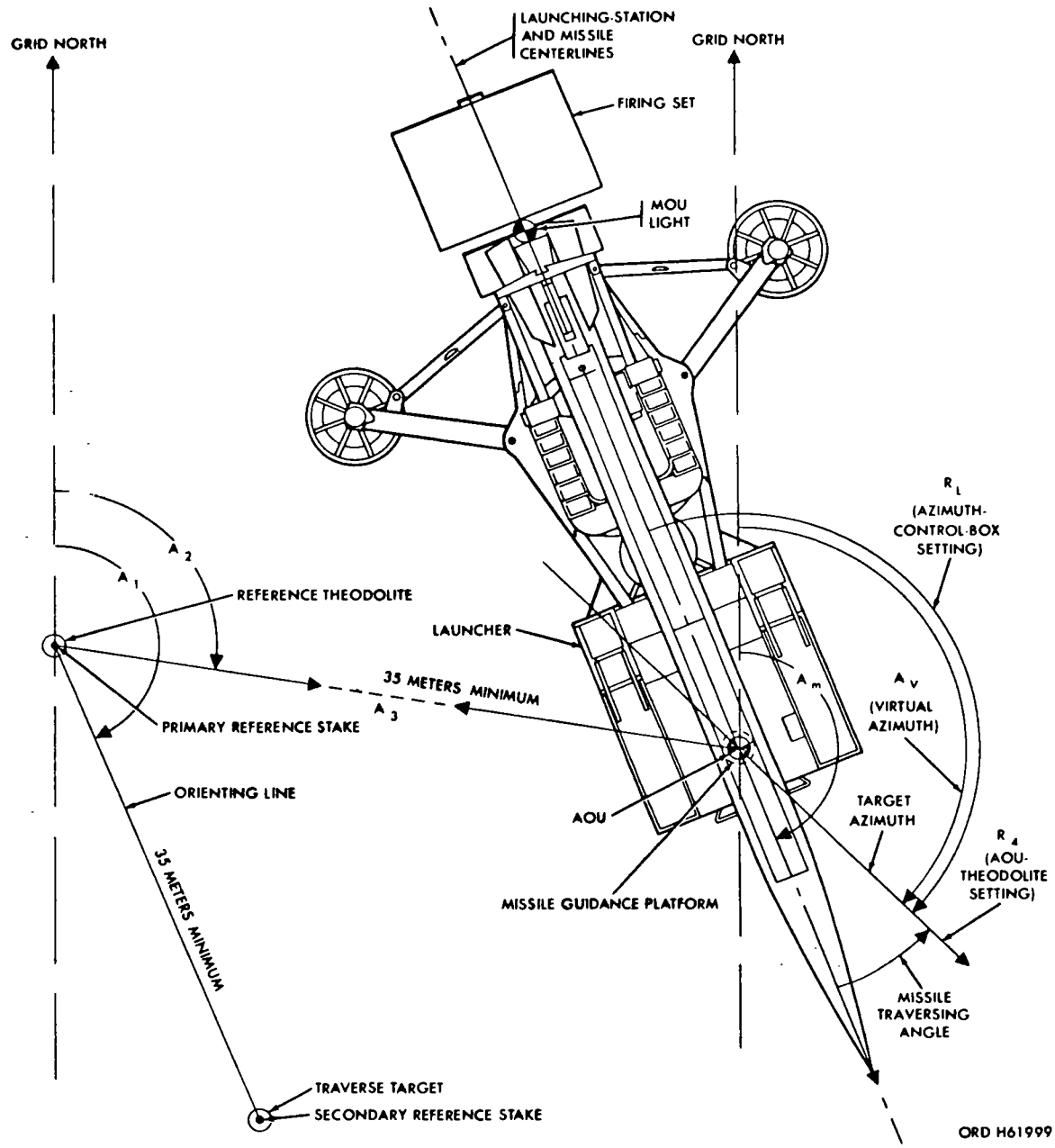
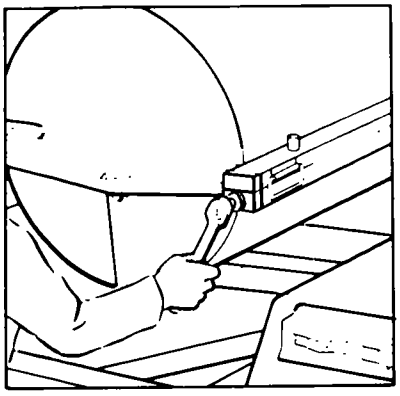
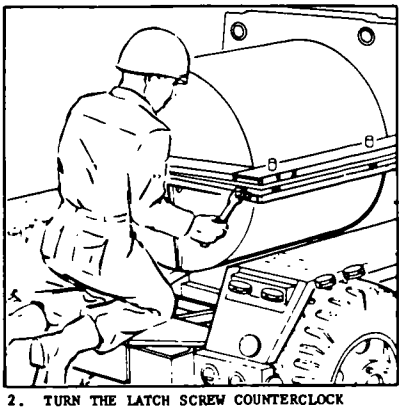


Figure 6. Azimuth orientation equipment positioning.

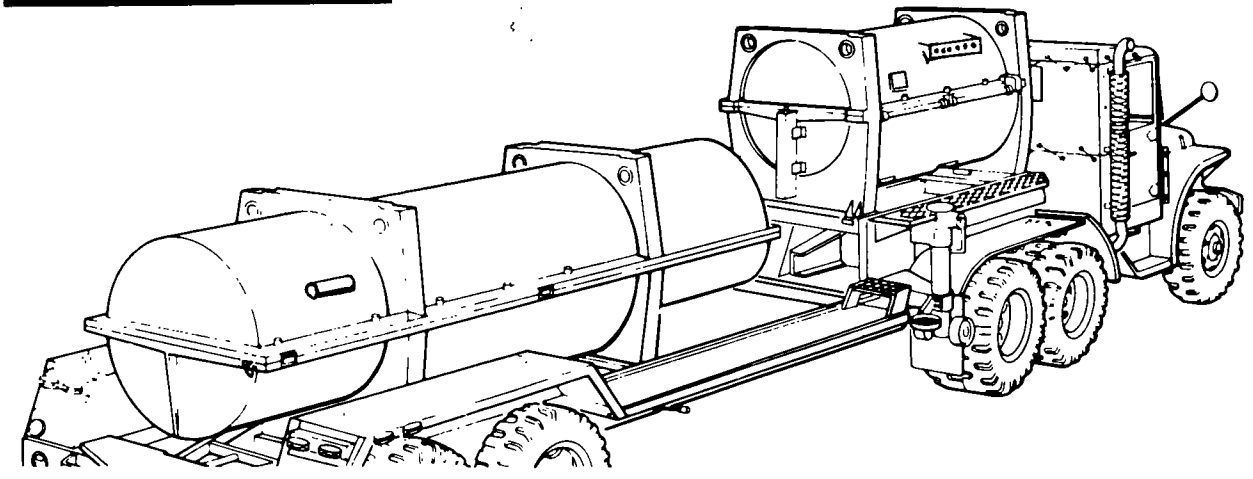


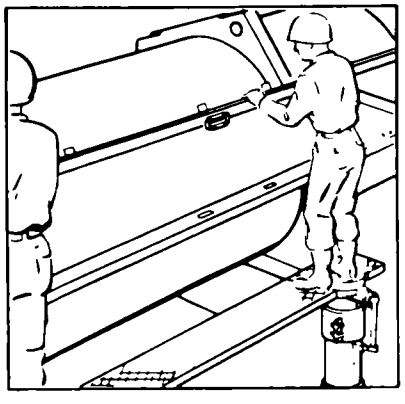
1. REMOVE THE LATCH SCREW DUST CAP BY TURNING THE CAP COUNTERCLOCKWISE TO RELEASE ANY AIR PRESSURE

NOTE. CHECK TO SEE THAT THE CONTAINER IS BOLTED DOWN BEFORE OPENING THE LID. IF THE CONTAINER IS EMPTY, IT WILL FALL FROM THE TRAILER

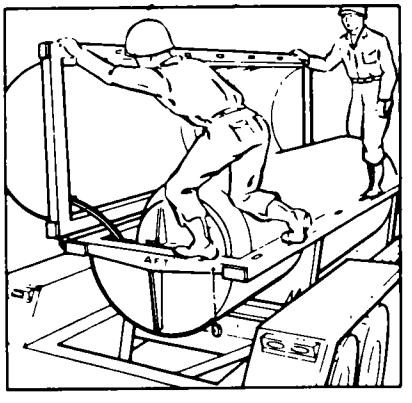


2. TURN THE LATCH SCREW COUNTERCLOCK WISE UNTIL THE LID SPRINGS PARTIALLY OPEN.



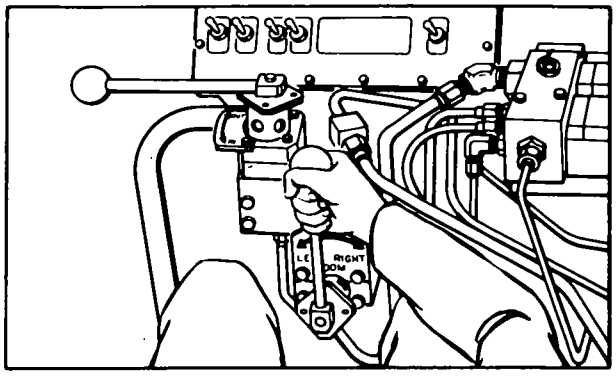


3. WITH ONE MAN AT EACH END, RAISE THE CONTAINER LID TO THE BALANCED POSITION.



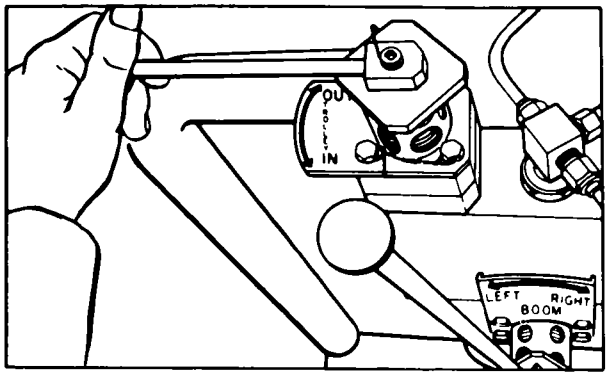
4. LOWER THE CONTAINER LID CAREFULLY TO THE TRAVEL LIMIT OF THE RESTRAINING ARM. REMOVE THE TWO PRIMER BAGS FROM THE CONTAINER AND PLACE THEM IN A SAFE LOCATION.

Figure 7. Opening a missile section container.



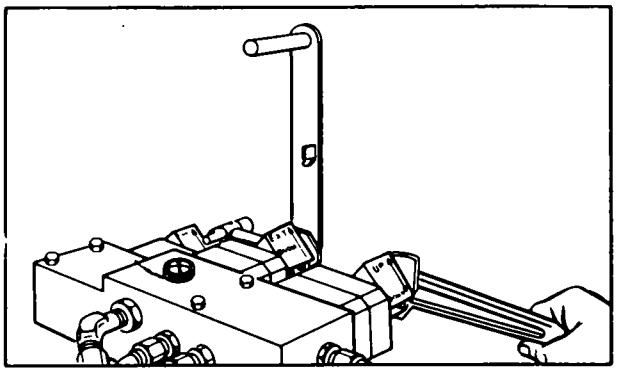
1. PLACE THE BOOM RIGHT LEFT VALVE TO EITHER RIGHT OR LEFT UNTIL THE BOOM IS POSITIONED OVER THE ROCKET MOTOR CONTAINER.

NOTE. RIGHT POSITION MOVES THE BOOM CLOCKWISE, AND LEFT POSITION MOVES THE BOOM COUNTERCLOCKWISE.



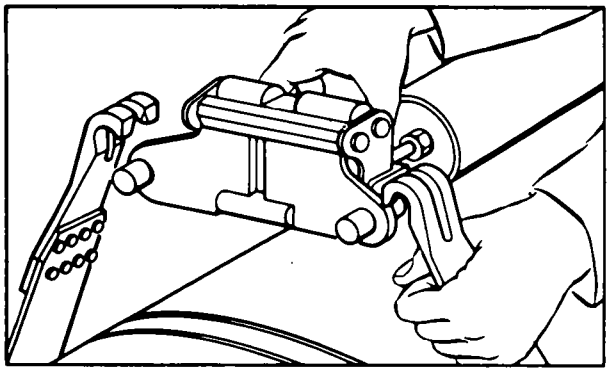
2. PLACE THE FRAME VALVE TO UP UNTIL THE D-FRAME STOPS AT THE FULLY EXTENDED POSITION: THEN LOCK THE FRAME VALVE IN THE UP POSITION. PLACE THE TROLLEY VALVE TO OUT UNTIL THE TROLLEY IS IN POSITION OVER THE ROCKET-MOTOR HANDLING FIXTURE.

WARNING: DO NOT ALLOW THE TROLLEY TO TRAVEL OUTWARD PAST THE PAINTED SAFETY MARK ON THE BOOM.

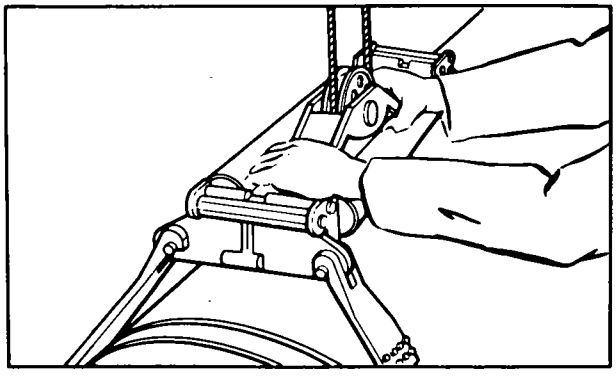


3. PLACE THE HOIST VALVE IN THE DOWN POSITION UNTIL THE HOIST IS IN POSITION TO ENGAGE THE ROCKET-MOTOR HANDLING FIXTURE.

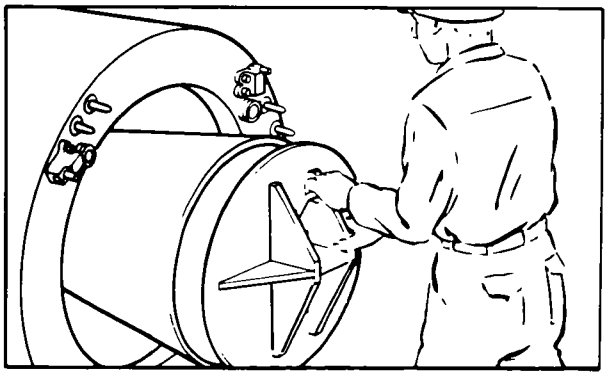
CAUTION: NEVER ALLOW ANY MORE SLACK IN THE HOIST CABLE THAN IS NECESSARY



4. HOOK THE ENDS OF THE ROCKET-MOTOR HANDLING FIXTURE ON THE HOIST HANGER PINS.

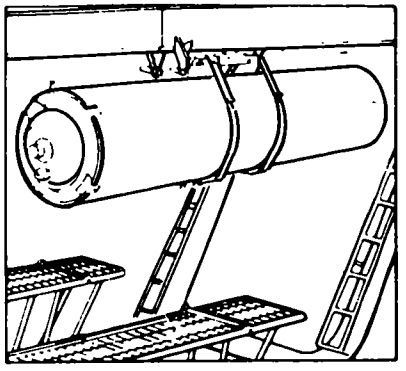


5. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE SLACK IS GONE FROM THE HOIST CABLE. CHECK THE HANDLING FIXTURE FOR PROPER ENGAGEMENT WITH THE HOIST HANGER PINS.

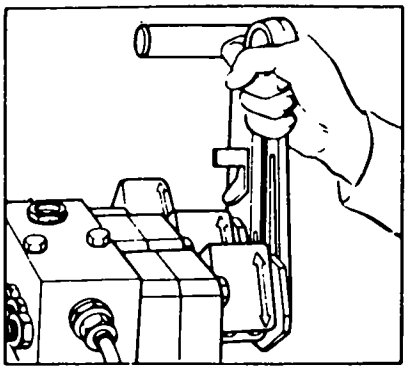


6. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE ROCKET MOTOR CLEARS THE CONTAINER. REMOVE THE NOZZLE CLAMP AND PLATE FROM THE ROCKET MOTOR AND PLACE THEM IN THE CONTAINER.

Figure 8. Removing the rocket motor from the rocket motor containers.

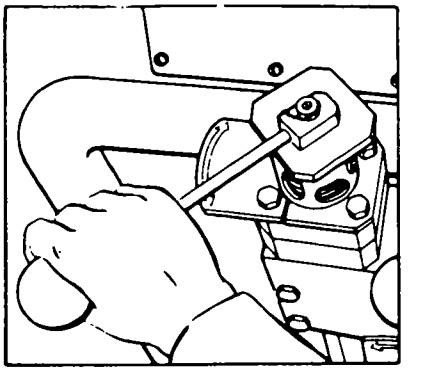


1. ALINE THE ROCKET MOTOR WITH THE BOOM.

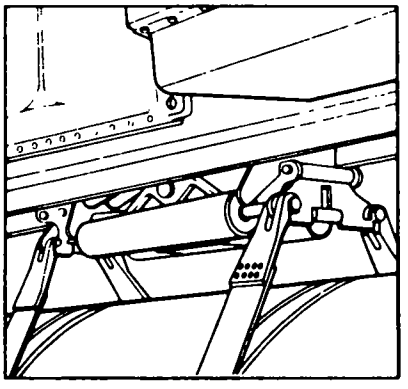


2. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE ROCKET MOTOR IS APPROXIMATELY 6 INCHES FROM THE BOOM.

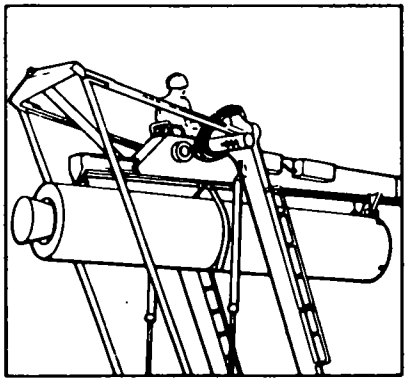
CAUTION: NEVER ALLOW ANY MORE SLACK IN THE HOIST CABLE THAN IS NECESSARY.



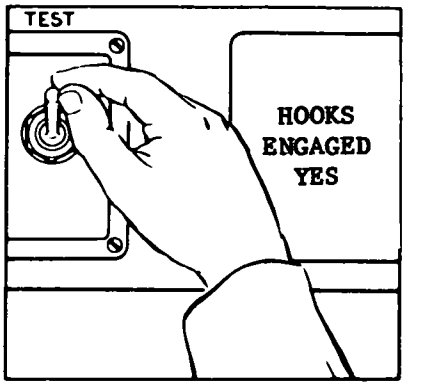
3. PLACE THE TROLLEY VALVE IN THE IN POSITION UNTIL THE ROCKET-MOTOR HANDLING FIXTURE IS CLEAR OF THE FORWARD HANGERS



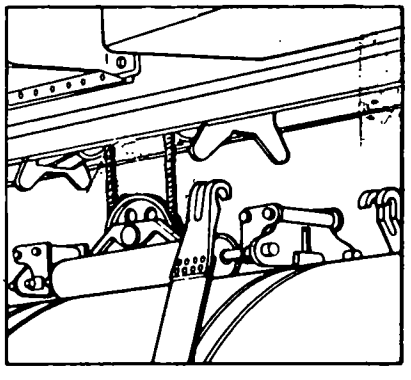
4. PLACE THE HOIST VALVE IN THE UP POSITION. LOCK THE VALVE IN THE UP POSITION WHEN THE MOTOR SECTION IS IN THE "FULL UP" POSITION.



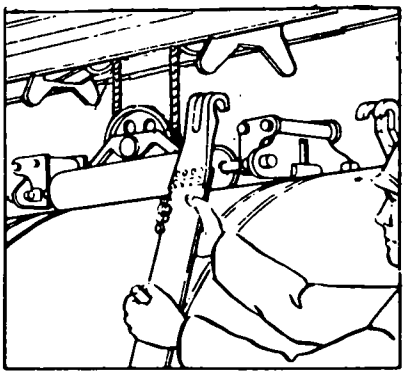
5. PLACE THE TROLLEY VALVE IN THE IN POSITION UNTIL THE ROCKET MOTOR ENGAGES THE FORWARD AND REAR HANGERS.



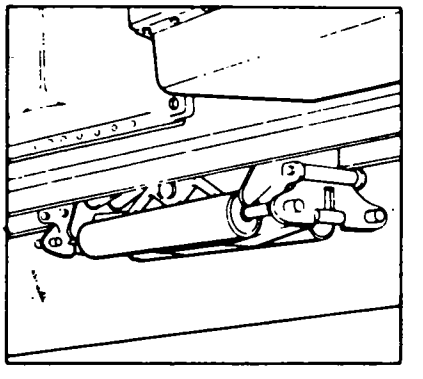
6. OPERATE THE HOOK TEST SWITCH AND CHECK THAT THE HOOKS ENGAGED YES INDICATOR LAMP GLOWS. VISUALLY AFFIRM THAT ALL HOOKS ARE ENGAGED.



7. PLACE THE HOIST VALVE IN THE DOWN POSITION UNTIL THE ROCKET MOTOR SLING CAN BE REMOVED.

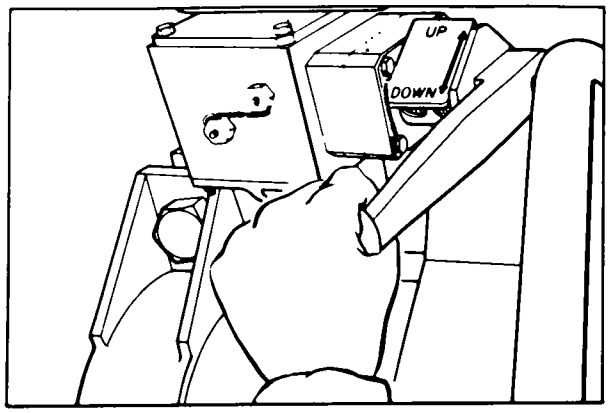


8. UNHOOK THE ENDS OF THE ROCKET-MOTOR HANDLING FIXTURE FROM THE HOIST HANGER PINS. DISENGAGE THE HANDLING FIXTURE FROM THE ROCKET MOTOR BY LIFTING UP ON EACH HANDLING FIXTURE HANDLE. RETURN THE ROCKET MOTOR HANDLING FIXTURE TO THE ROCKET MOTOR CONTAINER.

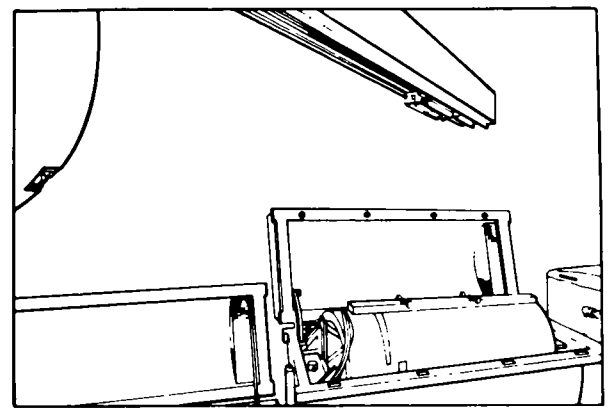


9. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE HOIST IS SEATED IN THE TROLLEY.

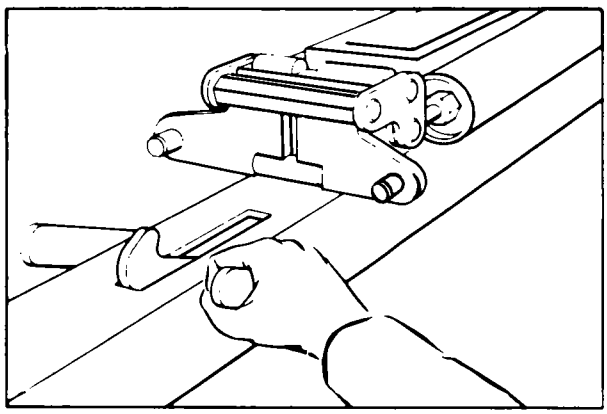
Figure 9. Engaging the rocket motor with the boom hangars.



1. PLACE THE FRAME VALVE IN THE DOWN POSITION UNTIL THE FRAME ACTUATORS ARE RETRACTED TO THE MECHANICAL STOPS.

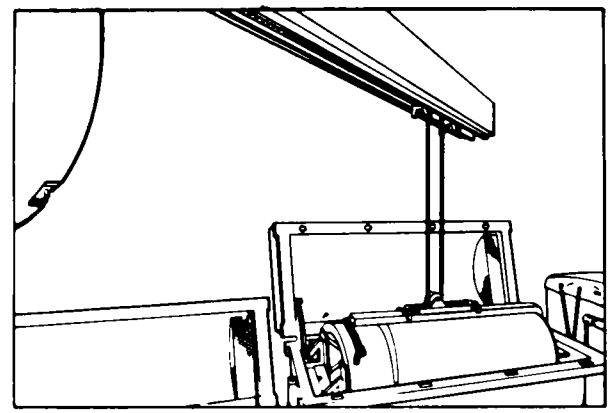


2. POSITION THE BOOM OVER THE GUIDANCE SECTION AND PLACE THE TROLLEY VALVE IN THE OUT POSITION UNTIL THE TROLLEY IS IN POSITION OVER THE GUIDANCE SECTION

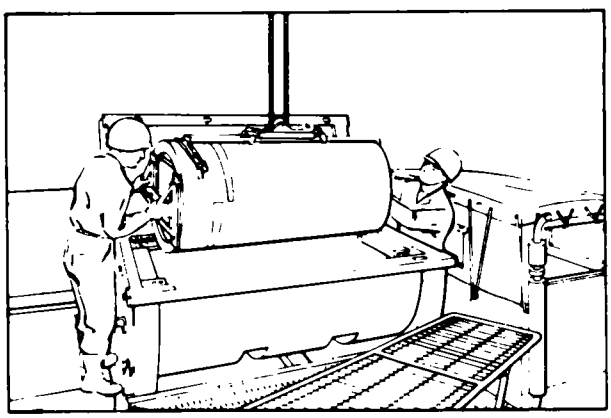


3. PLACE THE HOIST VALVE IN THE DOWN POSITION UNTIL THE HOIST CAN BE HOOKED ONTO THE GUIDANCE SECTION HANDLING FIXTURE.

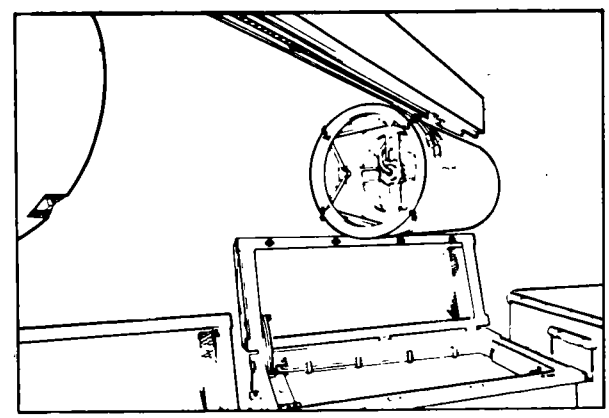
CAUTION: NEVER ALLOW ANY MORE SLACK IN THE HOIST CABLE THAN IS NECESSARY.



4. DISCONNECT THE NINE CONTAINER ELECTRICAL CONNECTORS FROM THE GUIDANCE SECTION AND REMOVE THE FORWARD- AND REAR-SUPPORT T-BOLTS. DRAPE THE GUIDANCE-SECTION CABLES OVER THE GUIDANCE SECTION. SWING THE HOIST HANGERS DOWN AND ENGAGE THEM WITH THE HOOKS ON THE GUIDANCE-SECTION HANDLING FIXTURE.

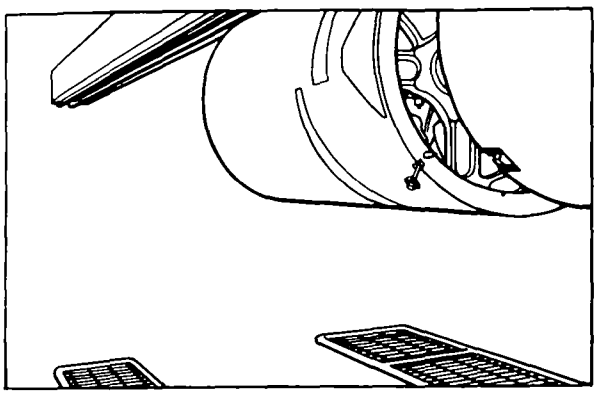


5. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE GUIDANCE SECTION CLEARS THE CONTAINER. REMOVE THE FORWARD AND REAR SUPPORTS.

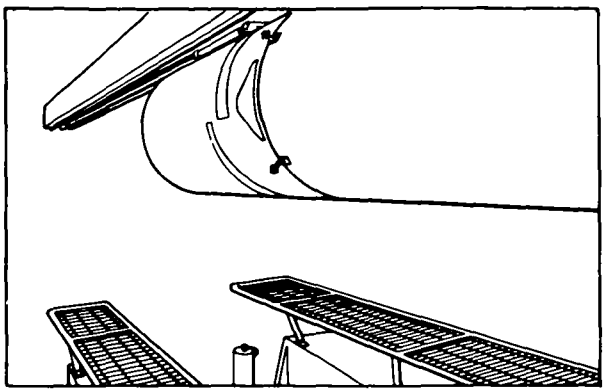


6. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE HOIST SEATS IN THE TROLLEY.

Figure 10. Removing the guidance section from its container.

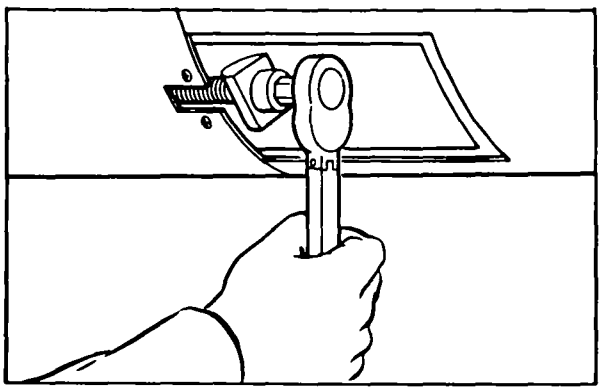


1. PLACE THE BOOM RIGHT LEFT VALVE IN THE RIGHT OR LEFT POSITION UNTIL THE BOOM IS POSITIONED OVER THE WORK PLATFORMS.

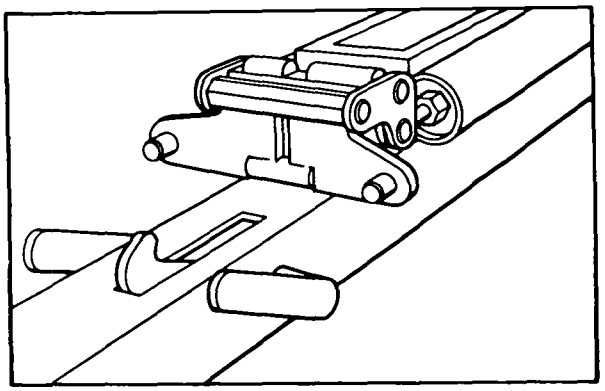


2. PLACE THE TROLLEY VALVE IN THE IN POSITION UNTIL THE GUIDANCE SECTION MATES WITH THE ROCKET MOTOR.

WARNING: KEEP HANDS CLEAR OF THE GAP BETWEEN THE GUIDANCE SECTION AND ROCKET MOTOR.

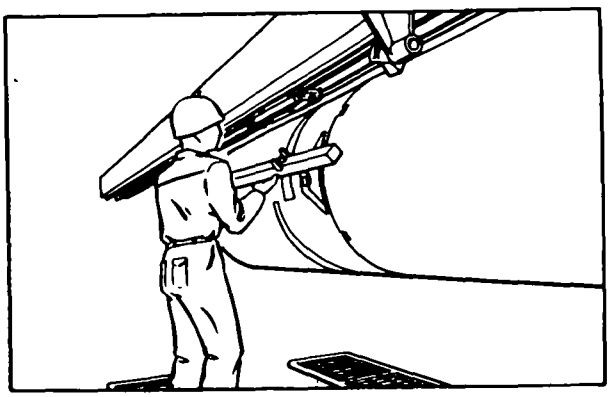


3. ATTACH THE GUIDANCE SECTION TO THE ROCKET MOTOR BY TIGHTENING THE GUIDANCE-SECTION TO ROCKET-MOTOR SWING BOLTS. TIGHTEN THE SWING BOLTS FIRST WITH A SPEED WRENCH; THEN USE A TORQUE WRENCH TO TIGHTEN THE BOLTS TO 1250 POUND-INCHES OF TORQUE.



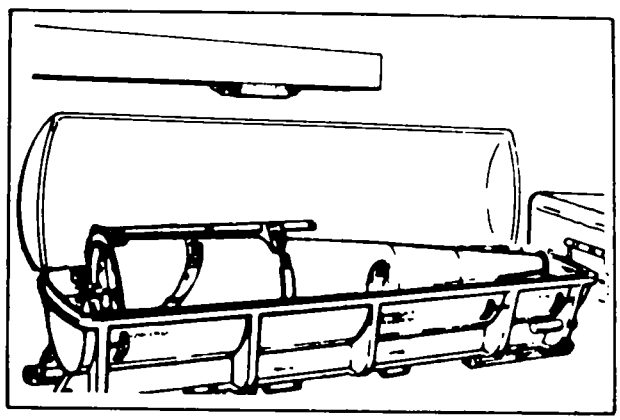
4. PLACE THE HOIST VALVE IN THE DOWN POSITION UNTIL THE HOOKS IN THE GUIDANCE-SECTION HANDLING FIXTURE DISENGAGE THE HOIST; THEN PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE HOIST IS SEATED IN THE TROLLEY.

CAUTION: DO NOT ALLOW ANY MORE SLACK IN THE HOIST CABLE THAN IS NECESSARY.



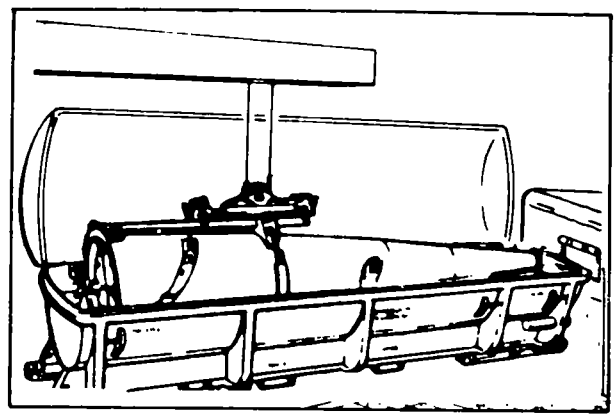
5. REMOVE THE GUIDANCE-SECTION HANDLING FIXTURE FROM THE GUIDANCE SECTION AND RETURN IT TO THE GUIDANCE SECTION CONTAINER.

Figure 11. Assembling the guidance section and the rocket motor.



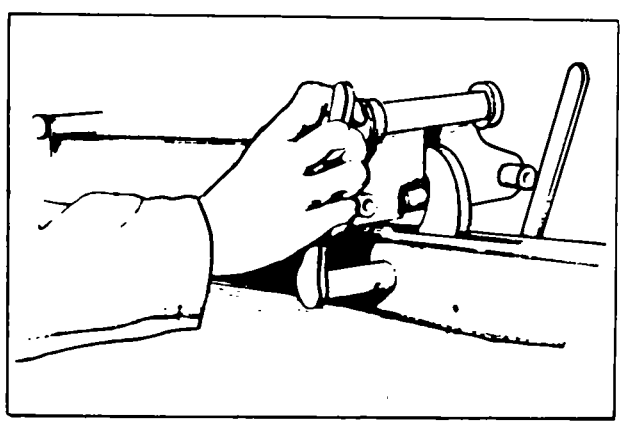
1. PLACE THE BOOM RIGHT LEFT VALVE TO RIGHT OR LEFT UNTIL THE BOOM IS POSITIONED OVER THE WARHEAD SECTION CONTAINER; THEN PLACE THE TROLLEY VALVE IN THE OUT POSITION UNTIL THE TROLLEY IS POSITIONED OVER THE WARHEAD SECTION.

NOTE. THE FRAME VALVE MAY BE PLACED IN THE UP POSITION AS REQUIRED FOR PROPER POSITIONING OF THE TROLLEY OVER THE WARHEAD SECTION.



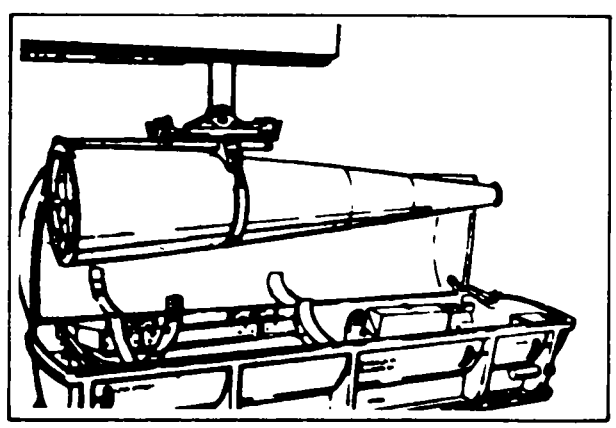
2. PLACE THE HOIST VALVE IN THE DOWN POSITION UNTIL THE HOIST RESTS ON THE WARHEAD SECTION HANDLING FIXTURE.

CAUTION: NEVER ALLOW ANY MORE SLACK IN THE HOIST CABLE THAN IS NECESSARY.



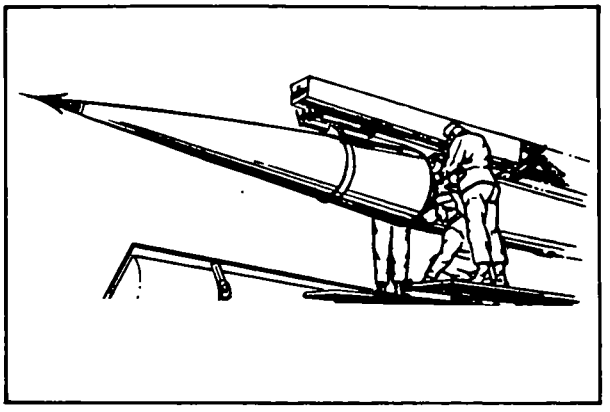
3. SWING THE HOIST HANGERS DOWNWARD AND ENGAGE THEM WITH THE HOOKS ON THE WARHEAD SECTION HANDLING FIXTURE.

CAUTION: INSURE THAT THE WARHEAD SECTION DOES NOT HIT ANY MISSILE SECTION CONTAINER DURING ROTATION.



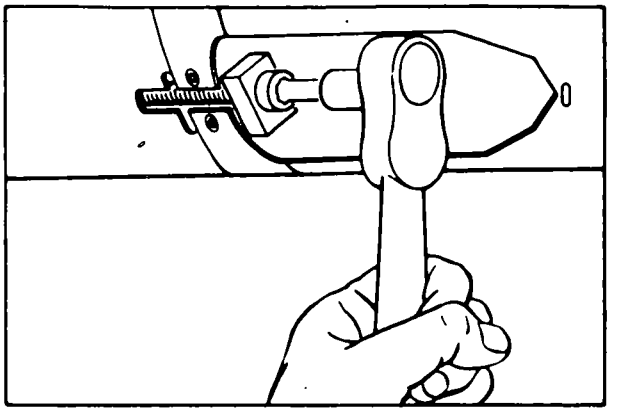
4. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE WARHEAD SECTION CLEARS THE WARHEAD SECTION CONTAINER. INSTALL WARHEAD STATIC TUBE ASSEMBLY. REMOVE SAFE PLUG AND INSTALL FIRE PLUG.

Figure 12. Removing the warhead section from its container.

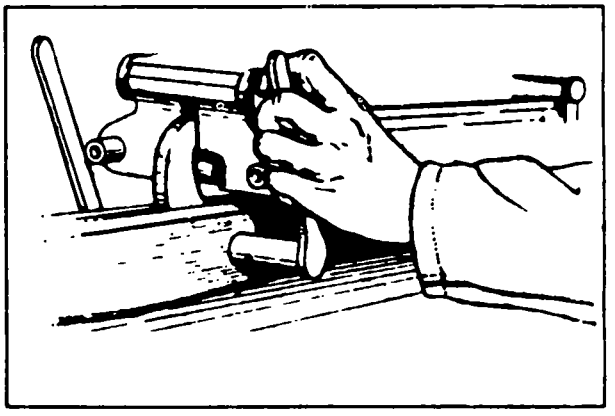


1. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE HOIST IS SEATED IN THE TROLLEY. PLACE THE TROLLEY VALVE IN THE IN POSITION UNTIL THE WARHEAD SECTION MATES WITH THE GUIDANCE SECTION.

WARNING: KEEP HANDS CLEAR OF THE GAP BETWEEN THE WARHEAD BODY SECTION AND THE GUIDANCE SECTION.

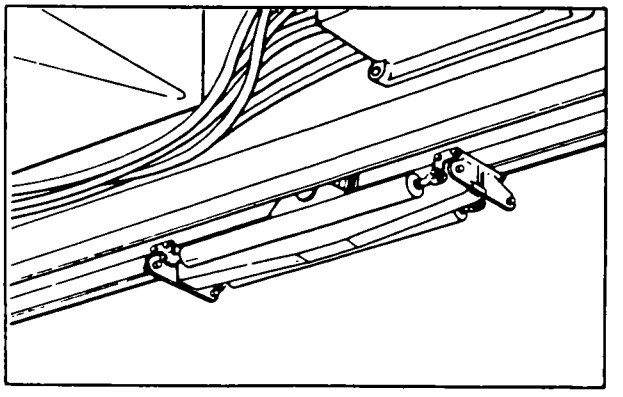


2. TIGHTEN THE WARHEAD SECTION GUIDANCE-SECTION SWING BOLTS FIRST WITH A SPEED WRENCH, THEN USE A TORQUE WRENCH TO TIGHTEN THE BOLTS TO 1250 POUND-INCHES OF TORQUE.

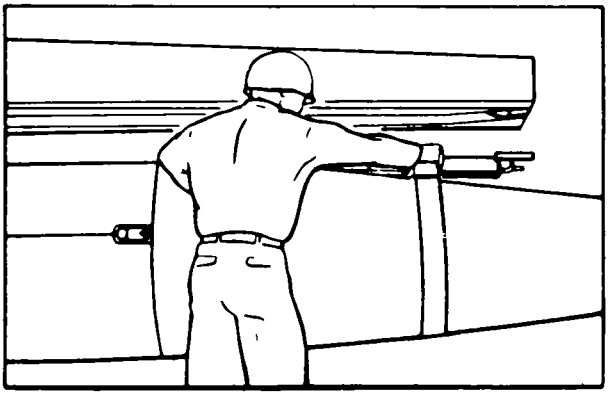


3. PLACE THE HOIST VALVE IN THE DOWN POSITION UNTIL THE HOOKS IN WARHEAD SECTION HANDLING FIXTURE DISENGAGE FROM THE HOIST.

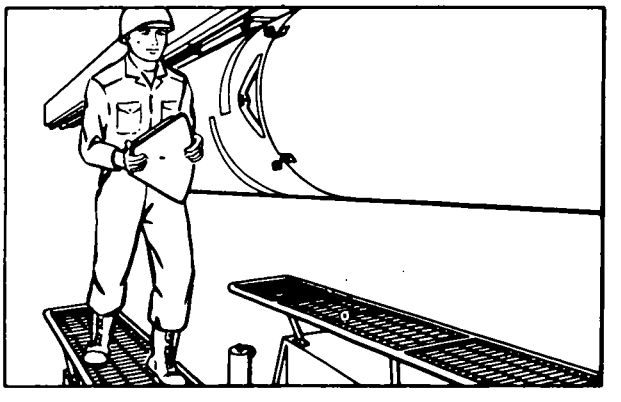
CAUTION: NEVER ALLOW ANY MORE SLACK IN THE HOIST CABLE THAN IS NECESSARY.



4. PLACE THE HOIST VALVE IN THE UP POSITION UNTIL THE HOIST IS SEATED IN THE TROLLEY. PLACE THE TROLLEY VALVE IN THE IN POSITION UNTIL THE TROLLEY STOPS.



5. REMOVE THE WARHEAD SECTION HANDLING FIXTURE FROM THE WARHEAD SECTION. RETURN THE WARHEAD SECTION HANDLING FIXTURE TO THE CONTAINER.



6. REMOVE THE GS ACCESS DOOR FOR ELECTRICAL CONNECTIONS BETWEEN GS AND ROCKET MOTOR.

Figure 13. Assembling the warhead section and the guidance section.

(2) For further information, refer to (C) FM 6–40–2, Field Artillery Missile Gunnery (U).

e. Prior to X−20 minutes crewman number 6 removes the cable and firing box from the door of the firing set, makes the necessary cable connections, and then –

(1) Contacts the firing set operator to insure that he is ready to check the firing box and cabling.

(2) Insures that the power switch is in the POWER ON position to test the firing box and checks the firing box.

12. Preparation of the Firing Set

a. The self-test of the firing set should be started as soon as the launching station is placed in position and uncoupled.

b. Detailed instructions pertaining to the firing set self-test are covered in TM 9–1440–301–12.

c. The firing set is composed of two identical electronic systems, which are referred to as system A and system B. Both systems may be self-tested simultaneously.

13. Hold Procedures and Limits for the Countdown

***Warning:* When any command hold is called, or if a failure hold occurs during the countdown, proceed only as far as instructed in *a* through *c* below.**

Note. See TM 9–1100–300–12 for further information on special warhead section hold procedures.

a. General. When any failure hold or command hold makes a return to X−20 minutes or X−7½ minutes in the countdown necessary (including mission cancellation), perform the applicable steps below in the order given. All personnel must clear the launching station area while the missile is elevated ((1) below). A minimum of personnel will be in the launching station area until after the procedures in (3), (4), and (5) below are completed.

(1) If the hold is initiated after X−90 seconds, lower the missile according to the correct alternate below.

(*a*) For a command hold called before X−20 seconds (by moving the FIRE HOLD switch to HOLD), wait until X−20 seconds (after automatic traversing is complete); check that the FIRE HOLD switch is in HOLD; then press the SAFE button and wait until the missile lowers fully to the 445-mil position.

(*b*) For a failure hold occurring before X−20 seconds, insure that the FIRE HOLD switch is in HOLD; then press the SAFE button and wait until the missile lowers fully to the 445-mil position.

(*c*) For any command hold called after X−20 seconds (by moving the FIRE HOLD switch to HOLD) or a failure hold occurring after X−20 seconds and before X−5 seconds, insure that the FIRE HOLD switch stays in HOLD and wait until X+2 minutes to press the SAFE button; wait until the missile lowers fully to the 445-mil position.

(*d*) For a failure hold occurring after X−5 seconds, including a failure of the missile to fire, insure that the FIRE HOLD switch is in HOLD by not later than X+10 seconds. (If the missile does not fire, set the FIRE HOLD switch to HOLD at approximately X+5 seconds.) Insure that the FIRE HOLD switch stays in HOLD and wait 30 minutes to press the SAFE button; wait until the missile lowers fully to the 445-mil position.

Note. Using the SAFE button makes a return to X—20 minutes necessary. If a failure indicator on the monitor-control assembly is illuminated when the SAFE button is pressed, no further indicators will illuminate when the SAFE button is used. Pressing the SAFE button after an X—20 second or X—100 millisecond command hold is called illuminates one monitor-control failure indicator.

(2) For a hold initiated at any time after X−20 minutes, reset the firing set and missile by pressing the CLEAR PROGRAM or RESET button, and continue the firing set operations when the START PROGRAM indicator illuminates. Pressing

the CLEAR PROGRAM button always resets the firing set and missile to X−20 minutes. Pressing the RESET button also resets the firing set and missile to X−20 minutes except during the period between X−7 minutes 29 seconds (called X−7½ minutes) and X−90 seconds; then pressing the RESET button it resets the firing set and missile to X−7½ minutes. If the countdown is returned to X−20 minutes, set both TEST OPERATE switches to TEST before proceeding. If the azimuth orientation unit has been mated with the missile inductosyn bar and the missile has not elevated, plunge the AOU telescope and sight the azimuth orientation unit missile orientation target before starting disassembly or any launcher operation which might damage the equipment or change the guidance-platform orientation.

(3) For a hold initiated after X−90 seconds, prepare the azimuth orientation system and launcher for a new countdown or disassembly.

(4) For a hold initiated after installation of the cartridge actuating device, remove the cartridge actuating device.

(5) For a hold initiated after X−20 seconds, check to find out if the missile battery is activated, and disconnect or replace the battery or replace the guidance section, as applicable. (A return to X−20 minutes is necessary.)

(6) For a hold after X−18 minutes and after the countdown has been returned to X−20 minutes, reset the baroswitch in the warhead section only if the warhead section is to be returned to the container.

(7) For a primary warhead section, perform the disenabling procedures in TM 9–1100–300–12.

b. Command Holds. It is possible to initiate a command hold at any time before X−100 milliseconds in the countdown and to resume operation at certain specific times. A command hold cannot be called after X−100 milliseconds. Command holds are of two types, a programmed hold that occurs automatically in every countdown and is ended by the normal mission operating procedures and a hold that is initiated by pressing the HOLD button on the monitor-control assembly (before the X−2 MIN indicator on the firing box illuminates) or by setting the FIRE HOLD switch on the firing box to HOLD (after the X−90 SEC indicator illuminates). The programmed hold is at X−2 minutes. The other times from which the countdown can be continued after a command hold are X−7½ minutes, X−20 seconds, and X−100 milliseconds. When the missile and firing set must be reset, the CLEAR PROGRAM or RESET button on the monitor-control assembly is pressed. Pressing the CLEAR PROGRAM button always resets the firing set and missile to X−20 minutes. Pressing the RESET button has the same effect as pressing the CLEAR PROGRAM button except during the period between X−7½ minutes and X−90 seconds. Pressing the RESET button between X−7½ minutes and X−90 seconds resets the firing set and missile to X−7½ minutes. The hold-time limitations are defined below.

Warning: **Pressing the firing box SAFE button after X−90 seconds stops the automatic traversing cycle (if it is in progress) immediately, whether or not a command hold has been initiated, and starts the lowering of the missile immediately. Except in an extreme emergency, do not press the firing box SAFE button during the automatic traversing cycle, since an abrupt stop in traversing is dangerous and can damage the equipment.**

Caution: **The definite hold-time limits specified below must be observed.**

Notes. 1. The fuel supply is sufficient to operate the GTGS for approximately 8 hours. If it is necessary to refuel while the GTGS is operating, see TM 9–1440–301–12.

2. The HOLD indicator on the monitor-control assembly illuminates when the HOLD button is pressed or if a failure hold occurs. It does not illuminate for a command hold called after X−2 minutes.

(1) *X−7½ minute hold.* If the HOLD button on the monitor-control assembly is pressed after X−7½ minutes and before X−2 minutes, the firing set must be reset to either X−20 minutes or X−7½ minutes before operation can be resumed. When

the RESET button is pressed, the countdown is returned to X−7 minutes 29 seconds and remains there until operation is resumed. Before resuming operation, check that the operator control TRANSFER and STANDBY indicators are illuminated. To resume operation, press the START PROGRAM button on the monitor-control assembly. After pressing the START PROGRAM button, observe that the operator control STANDBY indicator goes out and that the OPERATE indicator illuminates. An X−7½ minute hold can be maintained for approximately 4 hours without seriously affecting system reliability. If the power selector switch for the system selected for the countdown is turned to POWER OFF or if the gas turbine generator set is shut down, it will be necessary to return the countdown to X−20 minutes.

(2) *X−2 minute hold.* When the X−2 MIN indicator on the firing box illuminates, the countdown stops automatically. This programmed hold is terminated when the FIRE HOLD switch is set to FIRE. (The countdown is resumed at X−90 seconds.) An X−2 minute hold must not exceed 10 minutes. If this limitation is exceeded, the countdown must be reset to X−7½ minutes or X−20 minutes. If the launching station is equipped with a 45-kw gas turbine generator set, resetting to X−7½ minutes during an X−2 minute hold will be successful no matter what mode the air-conditioning system was operating in at automatic shutdown; however, the usual precautions on recycling the cool mode within 5 minutes should be observed. (TM 5–4120–222–15.) If the launching station is equipped with a 30-kw gas turbine generator set, resetting to X−7½ minutes will be successful if the air-conditioning system was operating in the vent mode when automatic shutdown occurred at X−2 minutes and operation is resumed in that mode. However, if the launching station has a 30-kw gas turbine generator set and the air-conditioning system was operating in the cool mode or a heat mode when automatic shutdown occurred, it will probably be necessary to reset to X−20 minutes rather than X−7½ minutes. On a launching station with a 30-kw gas turbine generator set, if operation of the air-conditioning unit compressor is started in an X−7½ minute hold, either by pressing the RESET button or by using the air-conditioning controls, a *POWER LAUNCHING STATION* or *POWER FIRING SET* failure will probably occur. On a launching station equipped with a 45-kw gas turbine generator set, operation of the air-conditioning unit compressor can be started during the hold without causing a failure.

(3) *X−20 second hold.* A hold at X−20 seconds is initiated by setting the FIRE HOLD switch on the firing box to HOLD at any time between X−90 seconds and X−20 seconds. The countdown continues until X−20 seconds and then holds automatically. An X−20 second hold is terminated by setting the FIRE HOLD switch to FIRE to resume operations. If a hold at X−20 seconds exceeds 2 minutes, it will be necessary to lower the missile and to reset the firing set and missile to X−20 minutes.

(4) *X−100 millisecond hold.* A hold at X−100 milliseconds is initiated by setting the FIRE HOLD switch on the firing box to HOLD at any time between X−20 seconds and X−100 milliseconds. The countdown continues until X−100 milliseconds and then holds automatically. An X−100 millisecond hold is terminated by setting the FIRE HOLD switch to FIRE to resume operations. The total hold time after X−90 seconds cannot exceed 2 minutes. If this limitation is exceeded it will be necessary to lower the missile, reset to X−20 minutes, and replace the missile battery or guidance section.

c. Failure Holds. When an automatic hold occurs because of a failure, the program will stop, the HOLD indicator on the monitor-control assembly

will illuminate, and the monitor-control assembly will indicate the area of failure. When a failure occurs, the firing set and missile must be reset to X−20 minutes as described in (1) and (2) below and the standby system must be used to repeat the countdown. If a failure hold is called after X−90 seconds, proceed only as instructed in *a*(1)(*b*) or (*d*) above. Follow the other procedures in *a* above as applicable.

(1) Press the CLEAR PROGRAM button momentarily. If the RESETTING FIRING SET indicator illuminates, wait until the START PROGRAM indicator illuminates and the digits 20 appear on the TIME TO ZERO numerical indicators; then set the transfer box TEST OPERATE switch for the failed system to TEST and the TEST OPERATE switch for the reserve system to operate and proceed to (2) below. If the RESETTING FIRING SET indicator does not illuminate within 30 seconds after the CLEAR PROGRAM button is pressed, set the TEST OPERATE switch for the failed system to TEST and the TEST OPERATE switch for the reserve system to OPERATE. Press the CLEAR PROPRAM button and wait until the START PROGRAM indicator illuminates and the digits 20 appear on the TIME TO ZERO numerical indicators; then proceed to (2) below.

(2) Begin the countdown again. Troubleshoot the failed system when time and conditions permit.

14. Firing Procedures

Procedures for firing the missile are generally outlined in this section. The missile firing procedures consume the last 20 minutes before firing.

a. The fire mission will normally call for a time on target (TOT). The time to fire is obtained as follows:

(1) Obtain the time of flight for the mission. Refer to the time-of-flight graph in FM 6–40–2.

(2) Add 90 seconds to the time of flight to compensate for the automatic sequencing of the countdown.

(3) Subtract the total obtained in (1) and (2) above from the time on target. The result is the time at which the FIRE HOLD switch must be placed in the FIRE position to meet the time-on-target requirement.

b. As soon as the missile is assembled, the senior AOS operator positions and inserts the alinement tube as shown in figure 14. He then alines the guidance platform to the firing azimuth with the azimuth orienting unit as shown in figure 15. (Readings are recorded, as they are obtained, on the AOS data form.)

c. Operation of the firing set requires an attentiveness to duty and procedure. A general outline of duties is listed below; for detailed instructions, refer to TM 9–1440–301–12. A command hold may be placed into the firing set at any time during the countdown. All information within the firing set computer will be retained even though the power is turned off. Prior to starting operations again, the information stored in the memory unit should be checked. Information on operational hold limits is in paragraph 13. The procedures for the countdown are as follows:

(1) At X−20 minutes, the firing set operator begins the countdown using the following time chart and steps in figures 16, 17, 18, and 19:

(*a*) X−20 minutes...The firing set operator presses the START PROGRAM button on monitor control panel.

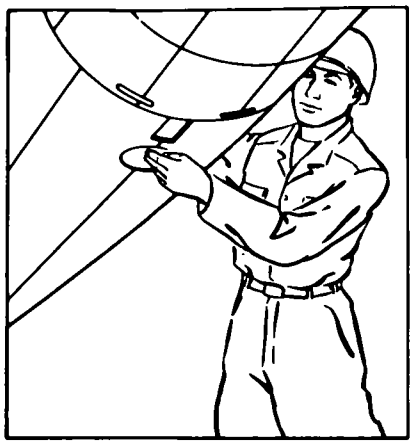
Note. X−19 – The firing set operator presses the START button on the operator control panel (only necessary if MWO 9–1440–301–50/4 has not been applied).

(*b*) X−13 minutes to...See figure 16, steps 3, 4, and 5.

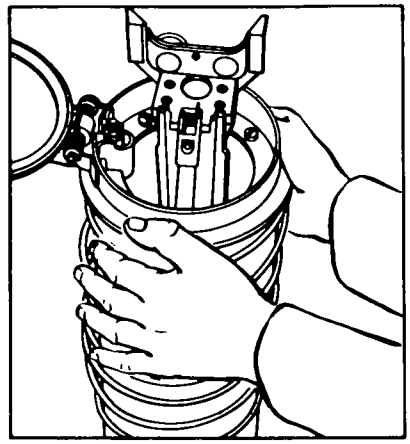
X−10 minutes

Note. X−9 minutes – The firing set operator presses the START button on the operator control panel. (Only necessary if MWO 9–1440–301–50/4 has not been applied.)

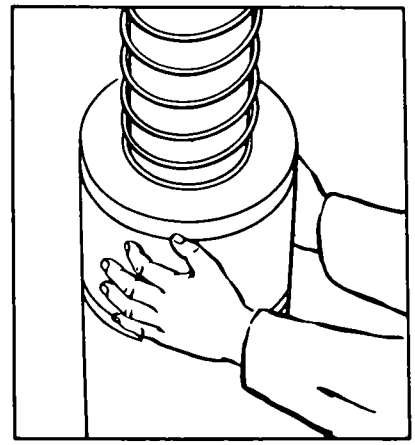
(*c*) Prior to X−3 minutes...The chief of section or assistant chief of section assisted by



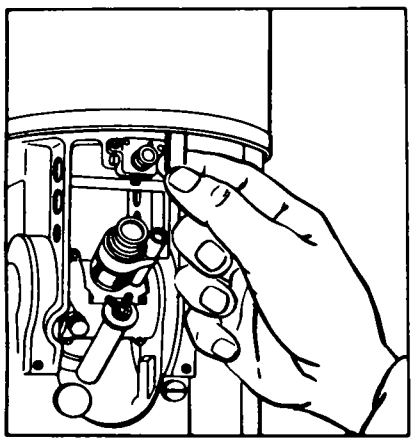
1. OPEN THE ACCESS DOOR ON THE UNDERSIDE OF THE GUIDANCE SECTION. PULL THE INDUCTOSYN COVER LOOSE.



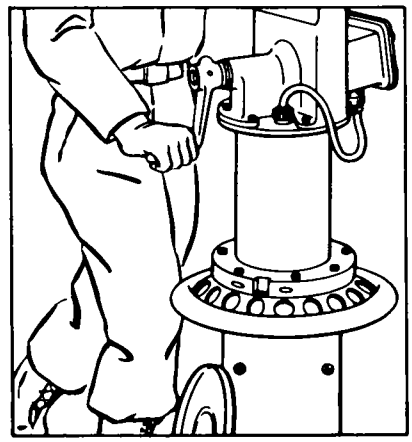
2. DEPRESS THE UPPER BLAST SHIELD. INSURE THAT THE AOU AND LAUNCHING STATION ARE LEVEL.



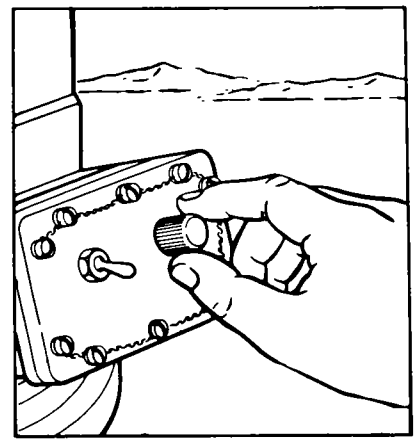
3. POSITION THE AOU ALINEMENT FLATS TOWARD THE FIRING SET.



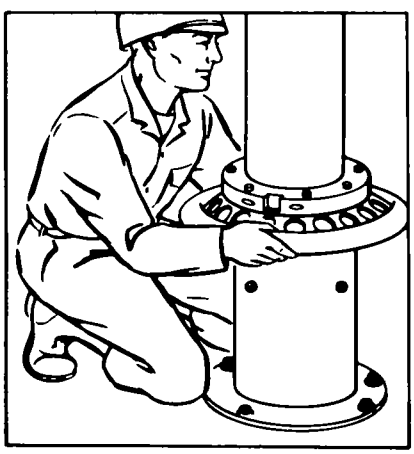
4. RAISE THE CAM FOLLOWER ON THE AOU ALINEMENT TUBE.



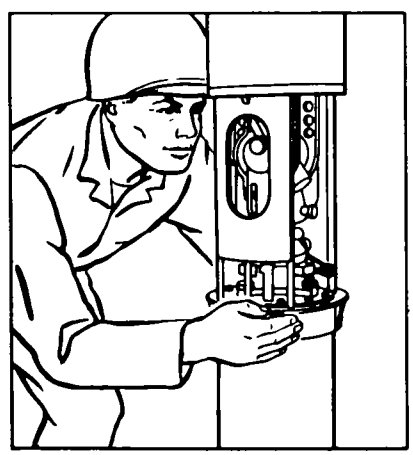
5. CRANK THE PEDESTAL UP TO START THE TUBE INTO THE GUIDANCE-SECTION ACCESS DOOR.



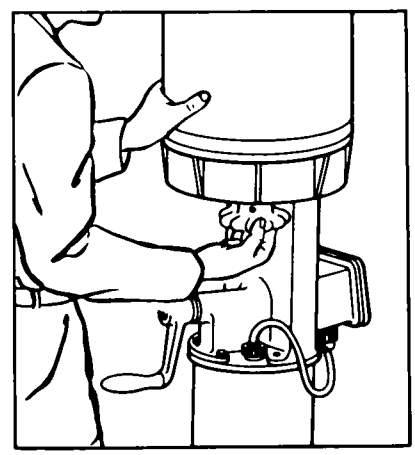
6. TURN ON THE AOU COLLIMATION LIGHT.



7. RAISE THE PEDESTAL UNTIL IT IS STOPPED. TURN THE HAND WHEEL TO LOCK IT.

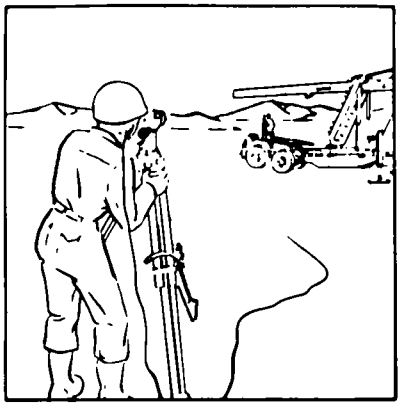


8. SEE THAT THE BEAD AND CROSSHAIRS ARE ALINED WITH THE CENTER OF THE INDUCTOSYN SHAFT (THRU THE OPTICAL PLUMMET). CAM FOLLOWER IS RELEASED.

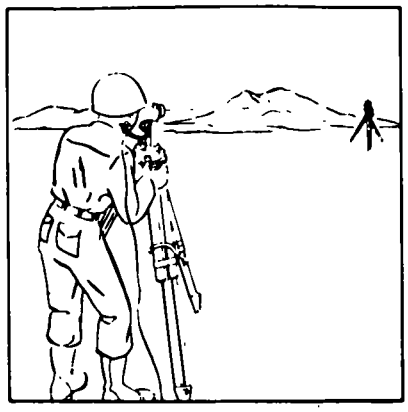


9. ADJUST AOU POSITIONING IF NECESSARY.

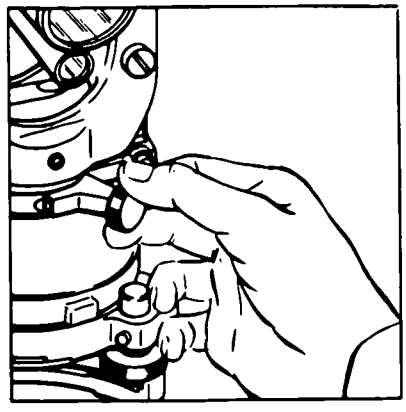
Figure 14. Inserting the alinement tube.



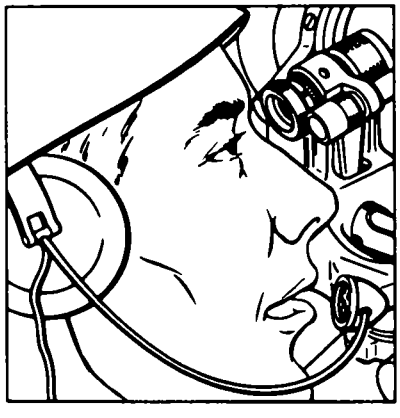
1. UNLOCK THE HORIZONTAL CIRCLE ON THE AOU AND SET THE CIRCLE TO SOME RANDOM READING. LOCK THE CIRCLE.



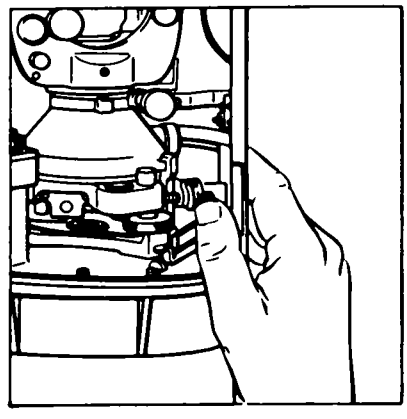
2. TURN ON THE TRAVERSE-TARGET LIGHT. REPEAT STEP 1 ON THE REFERENCE THEODOLITE. SIGHT THE REFERENCE THEODOLITE ON THE TRAVERSE TARGET TO OBTAIN R_1.



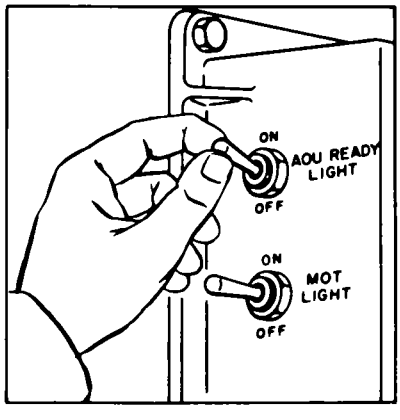
3. QUALIFY THE AOU AND THE REFERENCE THEODOLITE. THE REFERENCE THEODOLITE OPERATOR WILL NOW HAVE R_2 ON HIS HORIZONTAL CIRCLE. HE WILL CALL IN THE R_1 AND R_2 VALUES TO THE AOU OPERATOR.



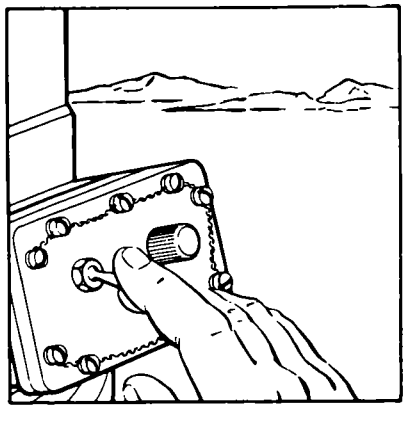
4. READ THE AOU HORIZONTAL CIRCLE AND RECORD THIS VALUE, R_3. TRANSMIT R_1, R_2, AND R_3 TO THE FIRING SET OPERATOR.



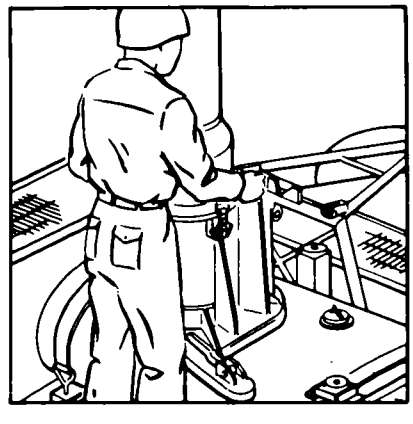
5. RECEIVE THE COMPUTED VALUE R_4 FROM THE FIRING SET OPERATOR. ROTATE THE AOU TO THIS SETTING AS SHOWN BY THE HORIZONTAL CIRCLE.



6. PLACE THE AOU READY LIGHT SWITCH ON THE AOU COMMUNICATIONS BOX TO ON. UNPLUG THE AOU HEADSET FROM THE AOU COMMUNICATIONS BOX.

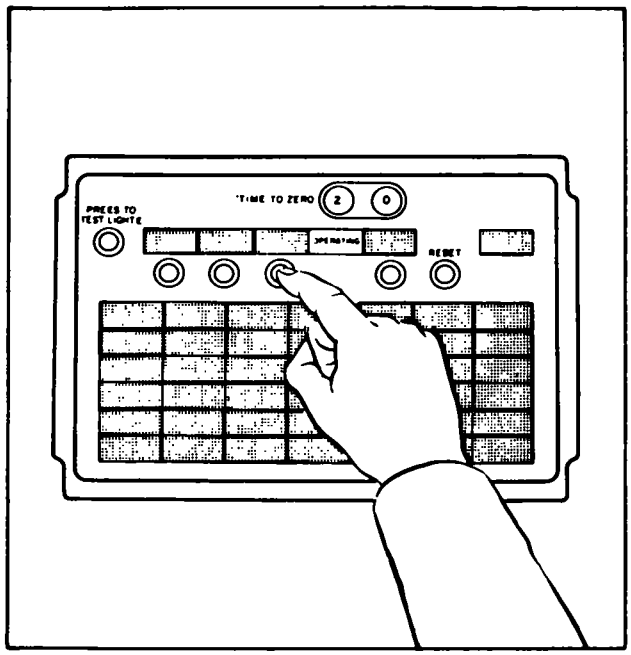


7. TURN OFF THE AOU COLLIMATION LIGHT LOWER THE BLAST SHIELD TO THE MONITORING (PARTIALLY CLOSED) POSITION.

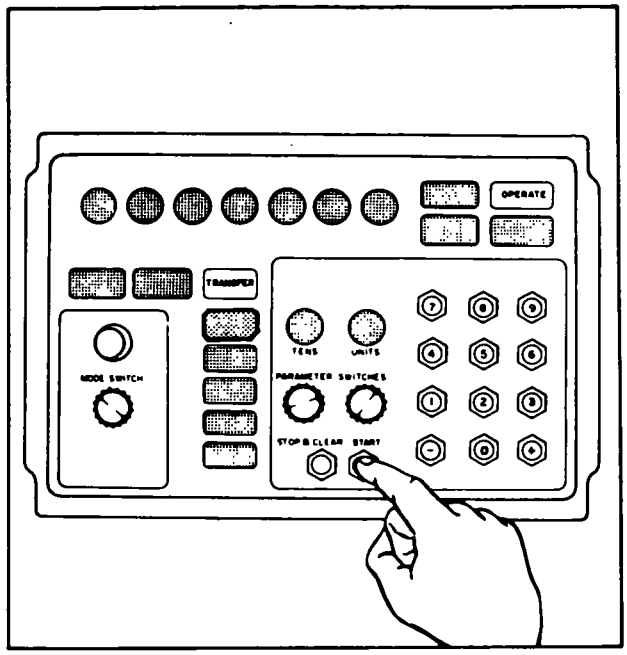


8. REINSTALL THE AOU CONTAINER IN ITS TRAVEL POSITION. CAREFULLY CLIMB DOWN AND WALK TO A SAFETY AREA.

Figure 15. Alining the azimuth orientation unit.

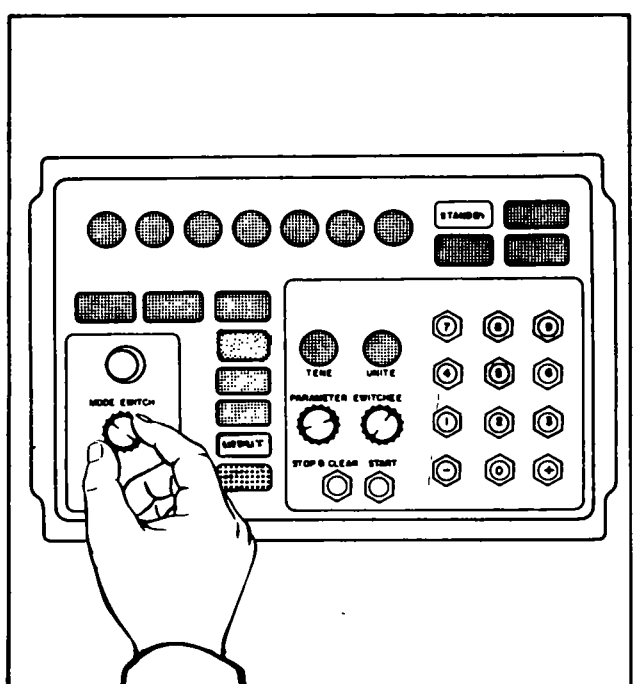


1. DEPRESS THE START PROGRAM BUTTON. THE START PROGRAM INDICATOR LAMP CEASES TO GLOW AND THE OPERATING INDICATOR LAMP GLOWS.

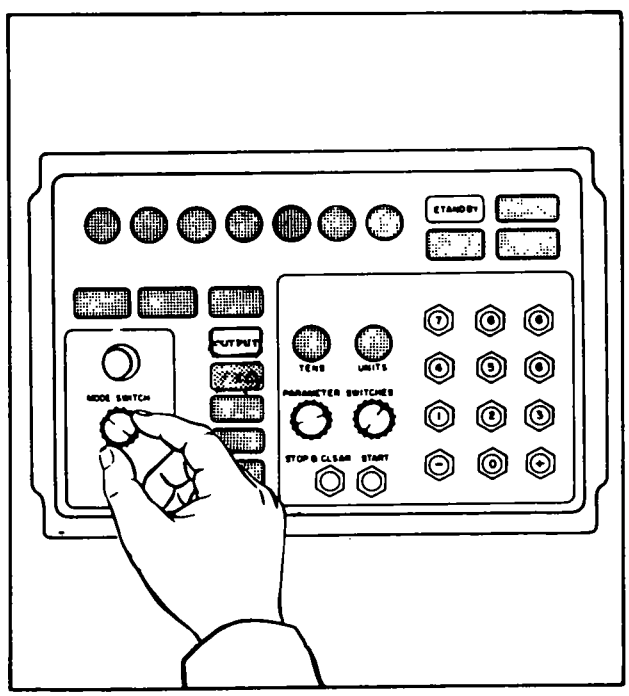


2. AT X–19 MINUTES, PRESS THE START BUTTON. THE STANDBY LAMP WILL CEASE TO GLOW; THE OPERATE INDICATOR LAMP WILL START TO GLOW AND WILL GLOW UNTIL TRANSFER IS COMPLETE. PRIOR TO X–13 MINUTES, THE OPERATE LAMP WILL CEASE TO GLOW AND THE STANDBY LAMP WILL GLOW AGAIN.

NOTE: THIS IS NOT NECESSARY IF MWO 9-1440-301-50/4 HAS BEEN APPLIED.



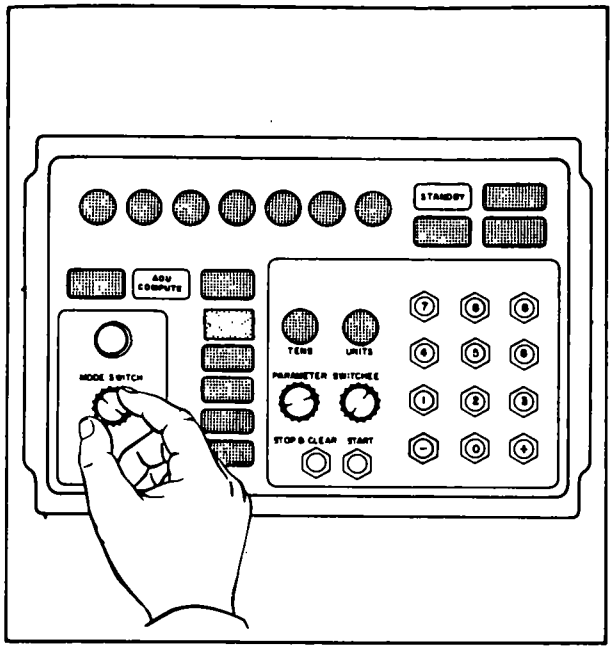
3. AT X-13 MINUTES, ROTATE THE MODE SWITCH UNTIL THE INPUT INDICATOR LAMP GLOWS. ENTER INPUTS R_1, R_2, AND R_3 IN THEIR RESPECTIVE BINS.



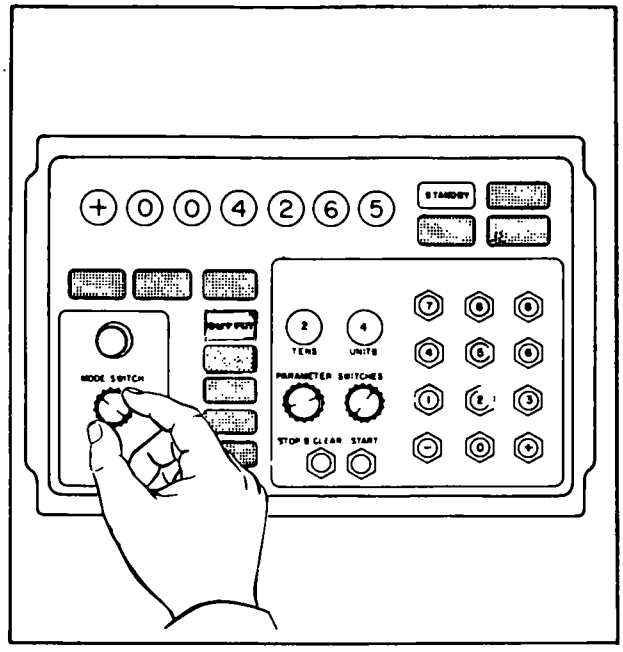
4. AT X–12 MINUTES 50 SECONDS, ROTATE THE MODE SWITCH UNTIL THE OUTPUT INDICATOR LAMP GLOWS.

NOTE. VERIFY THE INPUTS ENTERED IN STEP 3.

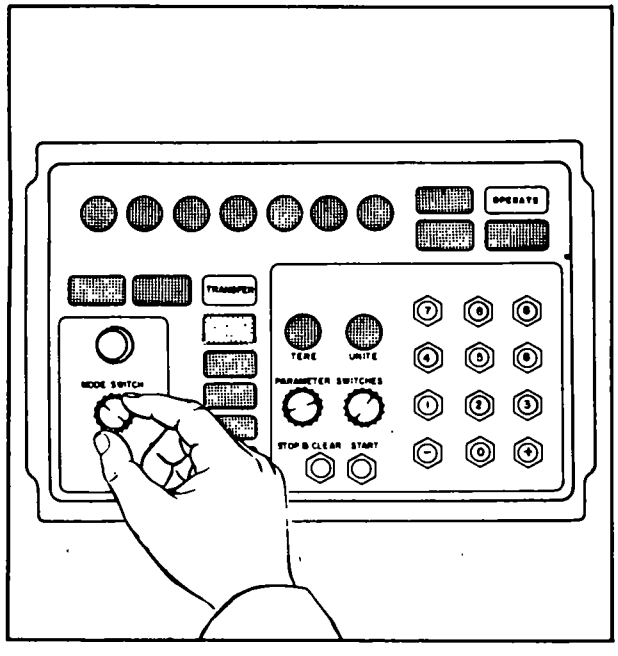
Figure 16. Operations during countdown (steps 1 through 4).



5. AT X-12 MINUTES 30 SECONDS, ROTATE THE MODE SWITCH UNTIL THE AOU COMPUTE INDICATOR LAMP GLOWS. DEPRESS THE START BUTTON.

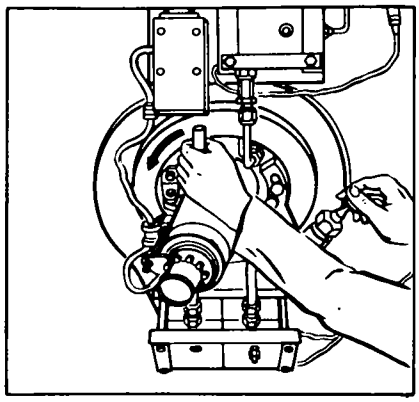


6. AT APPROXIMATELY X-12 MINUTES, POSITION THE PARAMETER SWITCHES TO SHOW THE OIGITS 2 AND 4 ON THE TENS AND UNITS INDICATORS. ROTATE THE MODE SWITCH UNTIL THE OUTPUT INDICATOR LAMP CLOWS. DEPRESS THE START BUTTON. READ THE VALUE (THE R_4 PARAMETER) ON THE NUMERICAL INDICATORS TO THE AOU OPERATOR AND THE CHIEF OF SECTION. OEPRESS THE STOP & CLEAR BUTTON.

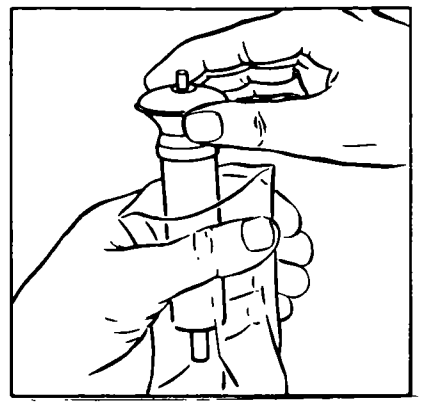


7. AT X-9 MINUTES, ROTATE THE MOOE SWITCH UNTIL THE TRANSFER LAMP CLOWS. OEPRESS THE START BUTTON. OBSERVE THAT THE STANDBY LAMP CEASES TO CLOW AND THAT THE OPERATE LAMP CLOWS UNTIL THE COMPLETION OF THE PARAMETER INSERTION, WHEN THE STANDBY LAMP GLOWS ACAIN.

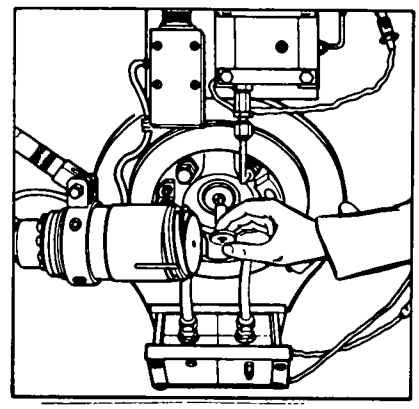
Figure 17. Operations during countdown (steps 5 through 7).



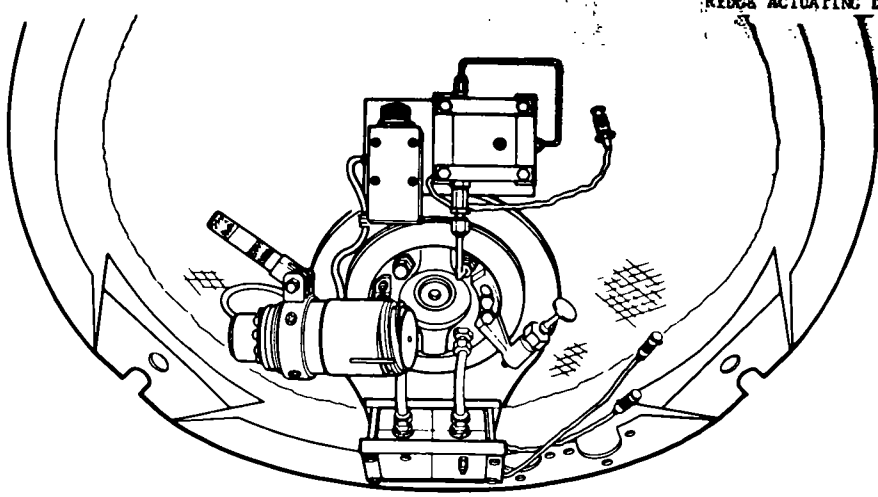
1. REACH THROUGH THE GS ACCESS DOOR AND PULL UP ON THE BREECH HANDLE LOCK ON THE FRONT OF THE ROCKET MOTOR. SWING THE BREECH HANDLE OUTWARD AND ROTATE THE HANDLE COUNTERCLOCKWISE.

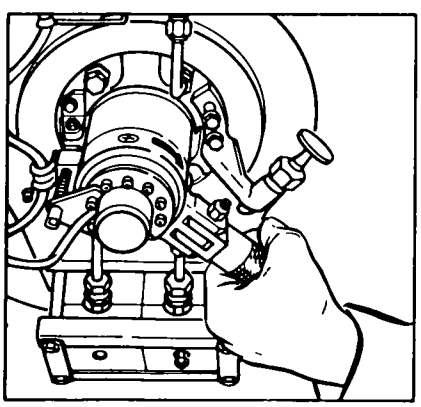


2. REMOVE THE CARTRIDGE ACTUATING DEVICE FROM ITS PLASTIC CONTAINER.

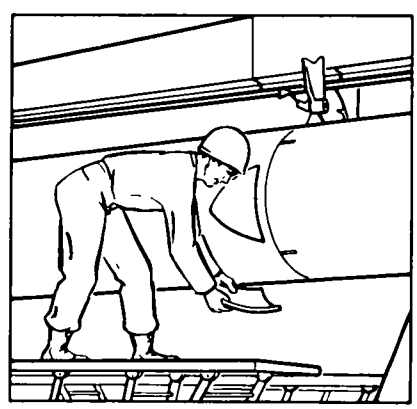


3. FOLD BACK THE INITIATOR ASSEMBLY AND INSERT THE CARTRIDGE ACTUATING DEVICE INTO THE CARTRIDGE ACTUATING DEVICE RECEPTACLE. PUSH THE CARTRIDGE ACTUATING DEVICE INSERTER RELEASE BUTTON AND REMOVE THE CARTRIDGE ACTUATING DEVICE INSERTER.

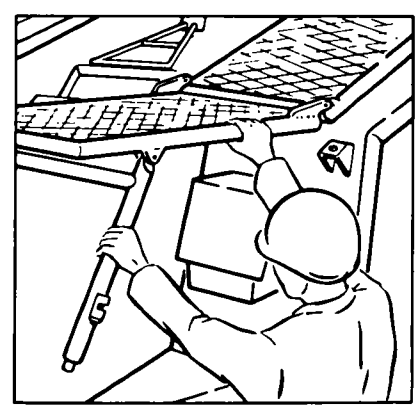




4. FOLD THE INITIATOR ASSEMBLY AND ROTATE IT IN PLACE WITH THE BREECH HANDLE. SWING THE BREECH HANDLE TOWARD THE MOTOR AND LATCH IT IN PLACE WITH THE BREECH HANDLE LOCK.

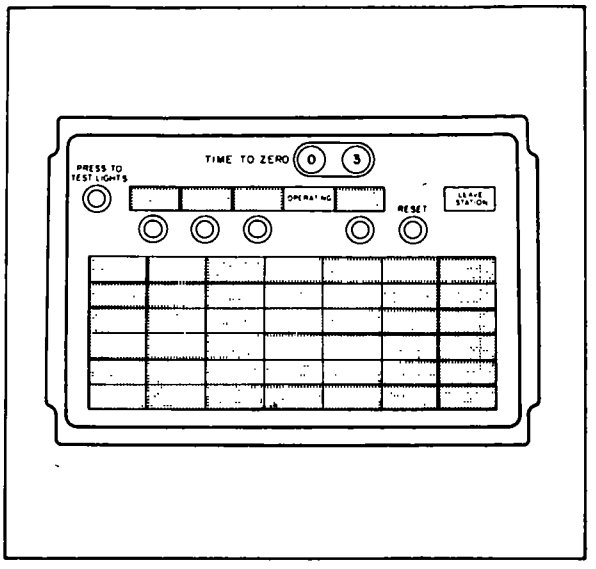


5. REPLACE THE GS ACCESS DOOR.



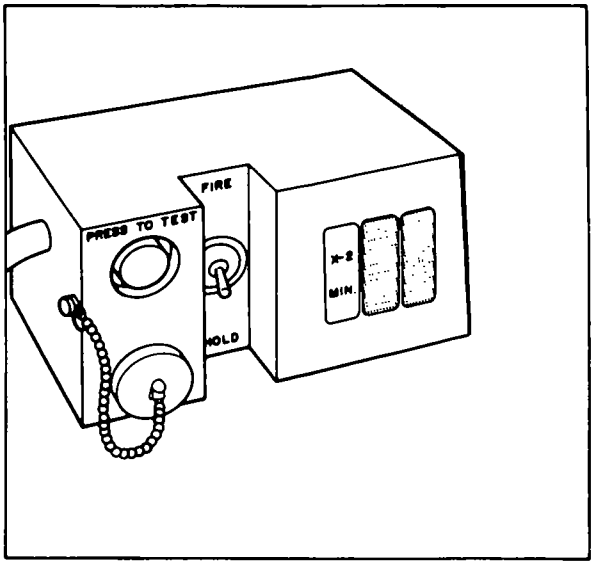
6. LOWER BOTH WORK PLATFORMS.

Figure 18. Operations during countdown at X—6.

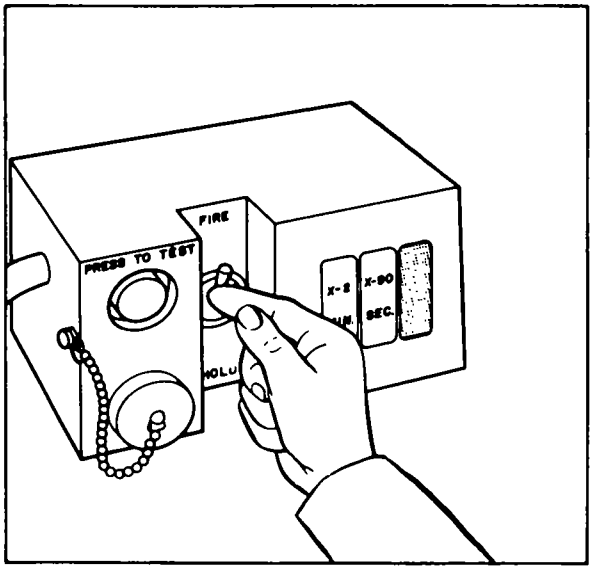


1. AT X–3 MINUTES, THE LEAVE STATION INDICATOR LAMP BEGINS BLINKING. EVACUATE THE FIRING AREA AND PROCEED TO THE REMOTE FIRING POSITION.

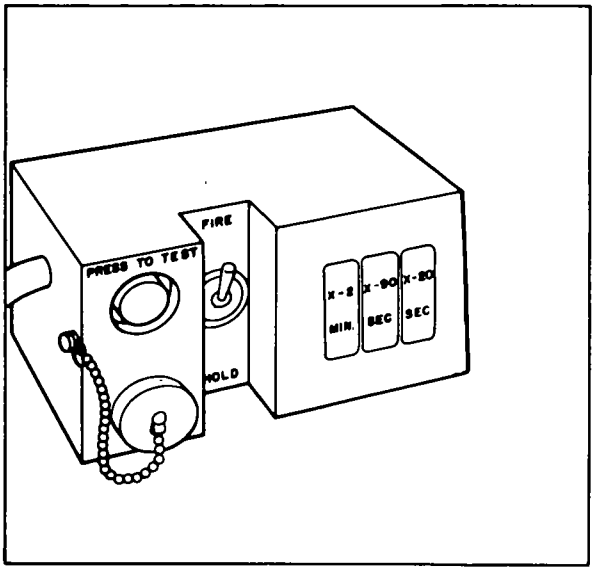
NOTE. TURN OFF THE STATION LIGHTS AND VENTILATING FAN. CLOSE THE VENT UPON LEAVING THE STATION.



2. AT X–2 MINUTES, THE X–2 MIN. LAMP ON THE FIRING BOX WILL START GLOWING.



3. UPON COMMAND, PLACE THE FIRE HOLD SWITCH TO THE FIRE POSITION. OBSERVE THAT THE X-90 SEC. LAMP STARTS GLOWING. THE X-2 MIN. LAMP CONTINUES TO GLOW.



4. AT X–20 SECONDS, OBSERVE THAT THE X–20 SEC. LAMP STARTS GLOWING. THE X–2 MIN. AND X–90 SEC. LAMPS CONTINUE TO GLOW.

NOTE. AT X–0, THE MISSILE WILL FIRE. AS SOON AS THE MISSILE LEAVES THE LAUNCHER, DEPRESS THE SAFE BUTTON ON THE FIRING BOX.

Figure 19. Operations during countdown from X—3 minutes.

crewman number 1 inserts the cartridge actuating device into the rocket motor (fig. 18). All personnel except the firing set operator evacuate the firing area.

(*d*) X—3 minutes...The LEAVE STATION lamp will start to blink. The firing set operator leaves the station and proceeds to the remote firing position (fig. 19) and waits for the X—2 MIN lamp to illuminate on the remote firing box.

(*e*) X—2 minutes...The X—2 MIN lamp illuminates. The F/S operator waits for command to fire at which time he places HOLD FIRE switch to the FIRE position.

(*f*) X—90 seconds...The X—90 SEC lamp illuminates when the HOLD FIRE switch is placed in the FIRE position.

(*g*) X—20 seconds...The X—20 SEC indicator lamp on the firing box illuminates (fig. 19).

Note. When the FIRE HOLD switch on the remote firing box is placed into the HOLD position from X—90 seconds until X—20 seconds the actual hold will not occur until just prior to X—20 seconds. Once the countdown has passed X—20 seconds, placing the HOLD FIRE switch into the HOLD position will cause a hold to occur at 100 milliseconds. Total hold time after X—90 seconds cannot exceed 2 minutes.

If this limitation is exceeded it will be necessary to lower the missile and RESET to X—20 minutes and replace missile battery or guidance section.

(*h*) X—0.....The missile fires, unless the FIRE HOLD switch has been placed to the HOLD position. As soon as the missile leaves the launcher, the firing set operator presses the SAFE button on the firing box.

(2) At X+1 minute, the firing set operator enters the firing set enclosure and places the appropriate transfer switch to the TEST position. The operator presses the CLEAR PROGRAM button on the monitor-control panel and confirms fired data if needed. The boom operator in the meantime returns the boom to the horizontal. The chief of section checks for blast and fire damage.

15. March Order of Launching Station

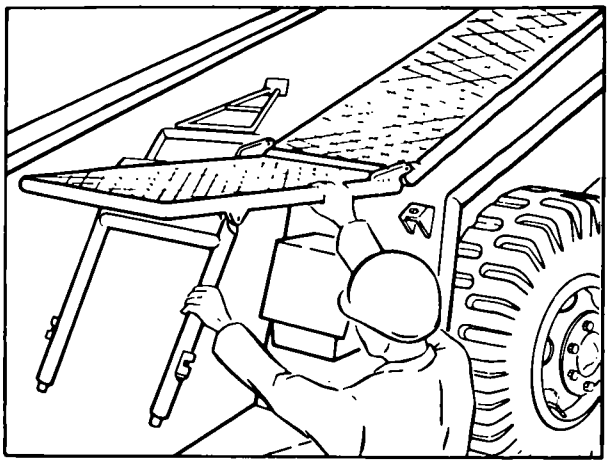
If an assembled missile is to be disassembled because of the cancellation of the fire mission, because of a malfunction, or for training purposes, figures 2 and 3 can be used for positioning the missile section transporters; figure 4, for hand signals; figure 7, for opening the missile section containers; figure 20 for removing the cartridge actuating device from the rocket motor; table III, for missile section disassembly; and table IV, for march order of launching station equipment.

16. Preparation for Missile Disassembly

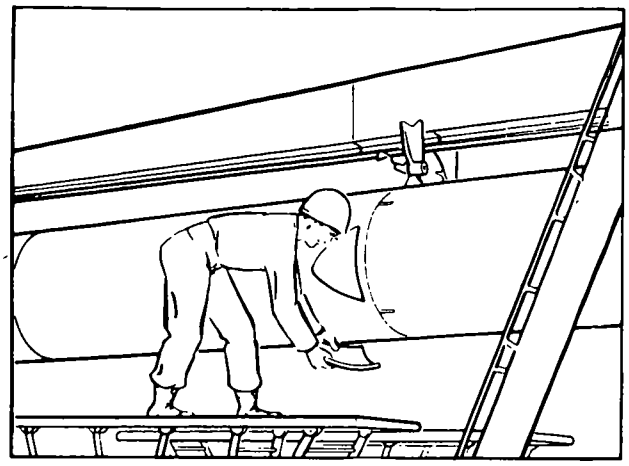
a. The firing set operator presses the SAFE button on the firing box, which lowers the missile to the 445-mil position. The senior AOS operator lowers the azimuth orientation unit.

b. The firing set operator enters the firing set and pushes the CLEAR PROGRAM button on the monitor control panel and confirms data. He then resets the warhead section baroswitches. The boom operator, supervised by the assistant chief of section (ACS), lowers and centers the missile between the work platforms.

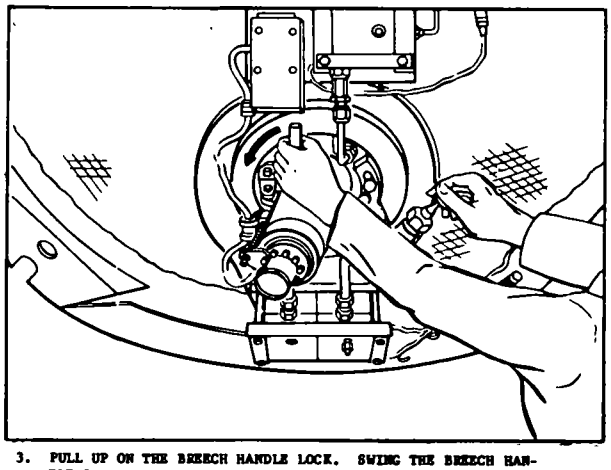
c. The chief of section or the assistant chief of section removes the cartridge actuating device from the rocket motor (fig. 20) before any other disassembly step is taken.



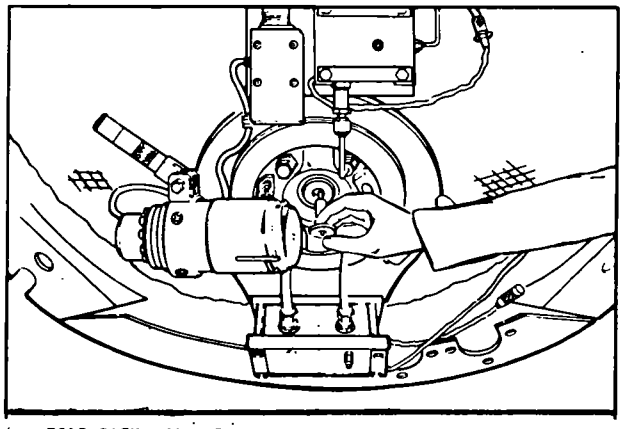
1. RAISE THE WORK PLATFORMS.



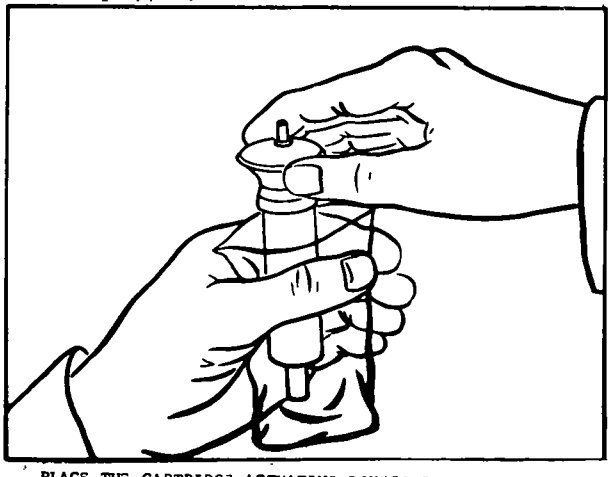
2. REMOVE THE GS ACCESS DOOR.



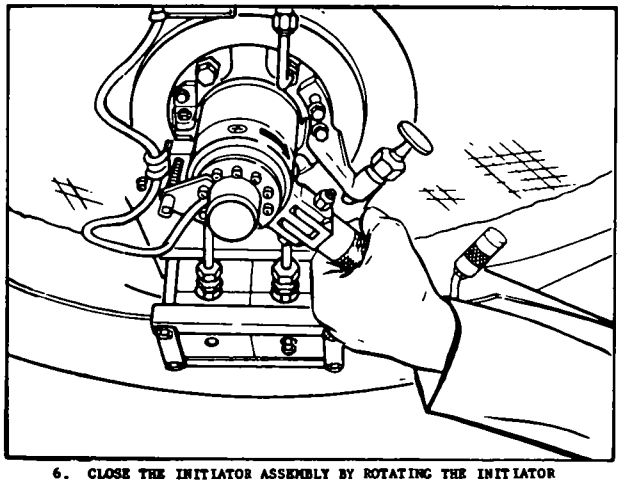
3. PULL UP ON THE BREECH HANDLE LOCK. SWING THE BREECH HANDLE OUTWARD AND ROTATE THE INITIATOR ASSEMBLY COUNTERCLOCKWISE.



4. FOLD BACK THE INITIATOR ASSEMBLY. INSERT THE CARTRIDGE ACTUATING DEVICE INSERTER INTO THE CARTRIDGE ACTUATING DEVICE. PULL OUTWARD ON THE INSERTER TO REMOVE THE CARTRIDGE ACTUATING DEVICE.



5. PLACE THE CARTRIDGE ACTUATING DEVICE IN ITS CONTAINER; THEN PLACE THE CARTRIDGE ACTUATING DEVICE IN THE ROCKET-MOTOR CONTAINER.



6. CLOSE THE INITIATOR ASSEMBLY BY ROTATING THE INITIATOR ASSEMBLY CLOCKWISE. SWING THE BREECH HANDLE TOWARD THE MOTOR AND LATCH IT IN PLACE WITH THE BREECH-HANDLE LOCK.

Figure 20. Removing the cartridge actuating device from the rocket motor.

Note. Personnel who are not actually involved in positioning the boom will remain clear of the area until the cartridge actuating device is removed.

d. As soon as the cartridge actuating device has been removed, the warhead section transporter is positioned and disassembly of the missile is accomplished in accordance with instructions contained in table III.

e. Once missile disassembly is complete, march order of the launching station can be accomplished in accordance with instructions contained in table IV.

f. Safety precautions should be observed in all phases of disassembly, and the missile sections should be packaged in a clean and dry condition for immediate reuse.

Note. Insure the container cables and inductosyn bar are secured.

CHAPTER 4

ORGANIZATIONAL MAINTENANCE TEST STATION AND MISSILE SECTION TEST AND ASSEMBLY REPLACEMENT

17. General

The organizational maintenance test station (OMTS) is a special testing van mounted on a semitrailer (figs. 21–23). The organizational maintenance test station is designed to test the missile guidance section and control surface assemblies in their containers. The organizational maintenance test station is also designed to perform a self-test of its electronic assemblies within the van prior to the missile guidance section and control surface assembly tests. This self-test gives greater assurance that the testing equipment is functioning properly when the missile guidance section and the control surface assemblies are tested. The test station is powered by a gas turbine generator set (GTGS). The references used by the missile test section are TM 5–6115–294–12, TM 5–6115–320–12, TM 9–1410–302–20, and TM 9–4935–303–12.

18. Emplacement

Several factors should be considered in choosing a position for emplacing the organizational maintenance test station. The position selected should be on smooth, hard ground to support the test station and provide easy accessibility for the motor guidance transport trailer. The maximum slope of this area should not exceed 1 in 10.

a. It is not necessary to uncouple the prime mover from the organizational maintenance test station in order to perform missile guidance section and control surface assembly tests unless high winds are present or expected.

b. If the prime mover is to be uncoupled and the ground is soft or muddy, it will be necessary to place planks or rocks under the OMTS landing gear to keep the van from sinking.

c. The procedures for emplacing the organizational maintenance test station are illustrated in figures 24 and 25.

19. Operation and Maintenance of the Gas Turbine Generator Set

The gas turbine generator set (GTGS) is a high-speed gas turbine engine mounted on the front of the organizational maintenance test station. The operation and maintenance of the generator are covered in TM 5–6115–294–12 and TM 5–6115–320–12.

20. Preparation for Test

a. Position the motor guidance transport trailer (MGTT) to the roadside of the OMTS van so that the front of the guidance section container is within 2 feet of the cable access door, and attach the cables to the missile containers as shown in figure 26 and described in TM–4935–303–12.

b. Start the gas turbine generator set and check the power distribution assembly for illuminated indicators in the upper left corner.

21. Self-Test of Organizational Maintenance Test Station

a. Set the TEST EQUIPMENT POWER switch on the power distribution assembly to the ON position. The TEST EQUIPMENT POWER indicator *must* light. Set the control panel FUNCTION switch to the OMTS position.

b. Press the START button on the control panel. If a failure occurs, refer to TM 9–4935–303–12 and locate the number displayed in the assembly number indicator. Perform the troubleshooting steps as outlined in TM 9–4935–303–12. Switch the control panel FUNCTION switch momentarily to the GUIDANCE SECTION position and then back to the OMTS position to reset the stepping switches. Press the START button again to initiate a retest.

c. Leave the power switch in the ON position after the COMPLETE indicator lights, unless no further testing is to be performed.

Note. Cables should not be connected with GUIDANCE READY or FIN READY switches ON.

d. Certain operations in the test section can be performed simultaneously. While the organizational maintenance test station is going through its self-test, the cables can be connected to the guidance section and the control surface assemblies. The interconnecting diagram for testing the missile sections in their containers (fig. 26) and a procedure for leveling the guidance section container (fig. 27) are included to assist personnel in performing these operations.

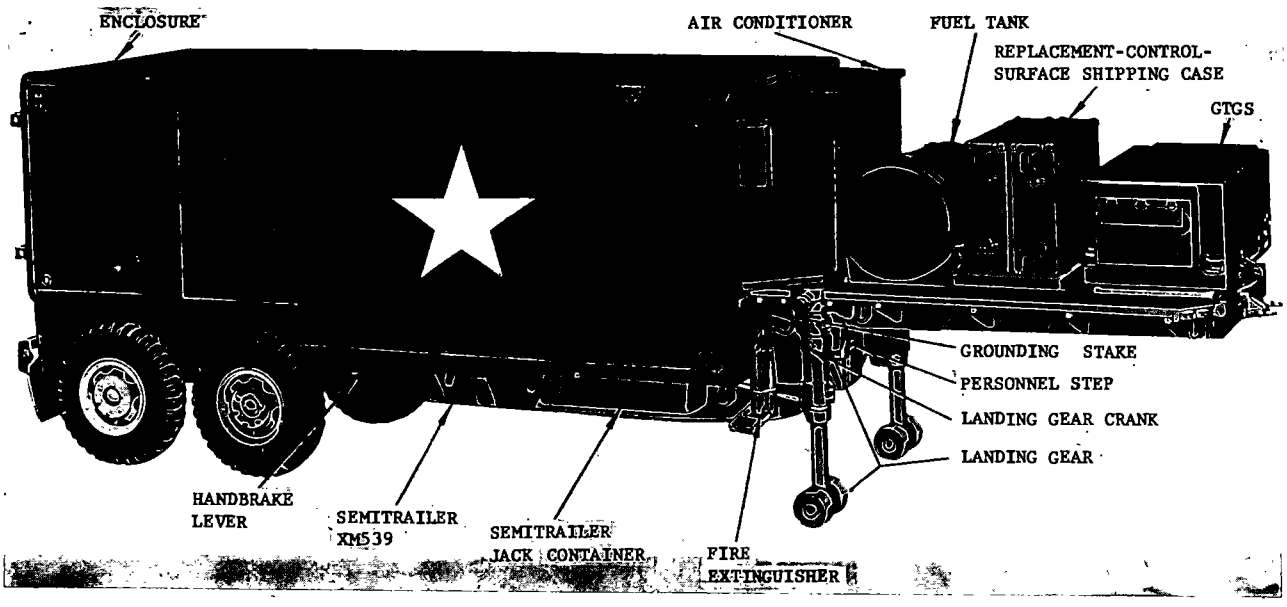


Figure 21. Organizational maintenance test station — right front.

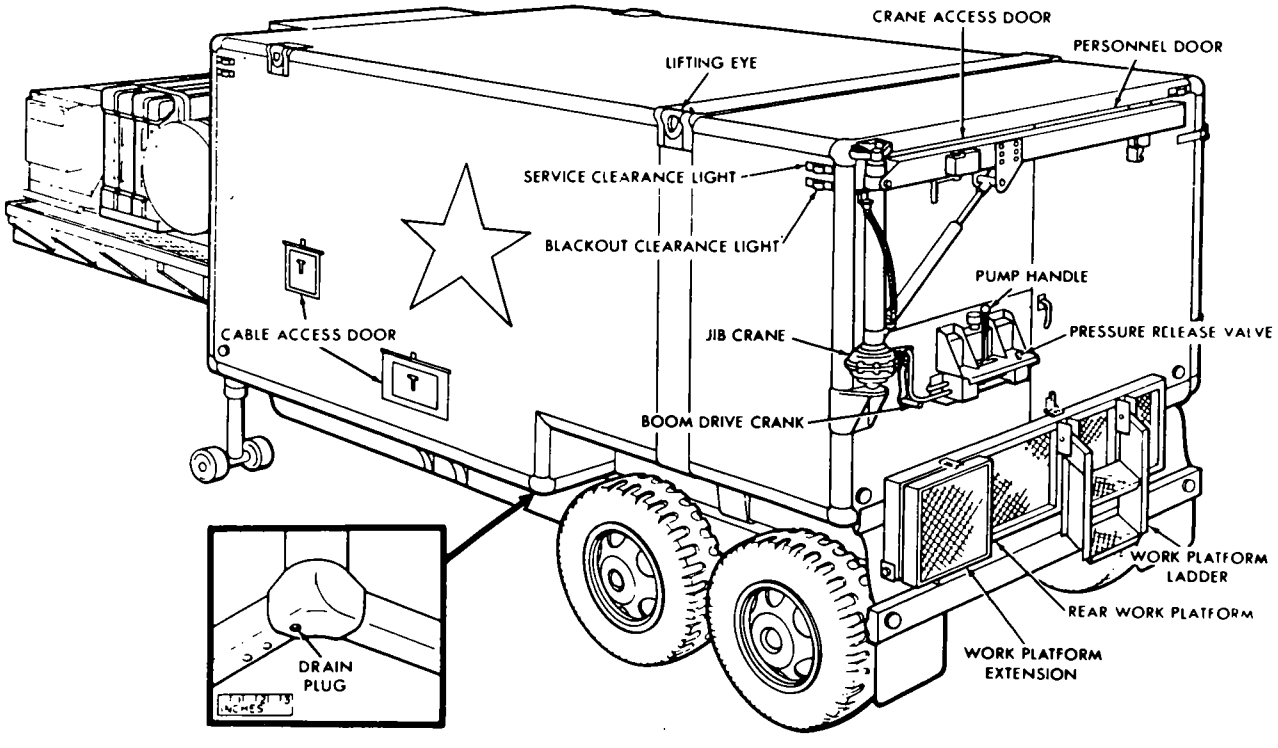


Figure 22. Organizational maintenance test station — left rear.

Figure 23. Organizational maintenance test station — cutaway interior rear view.

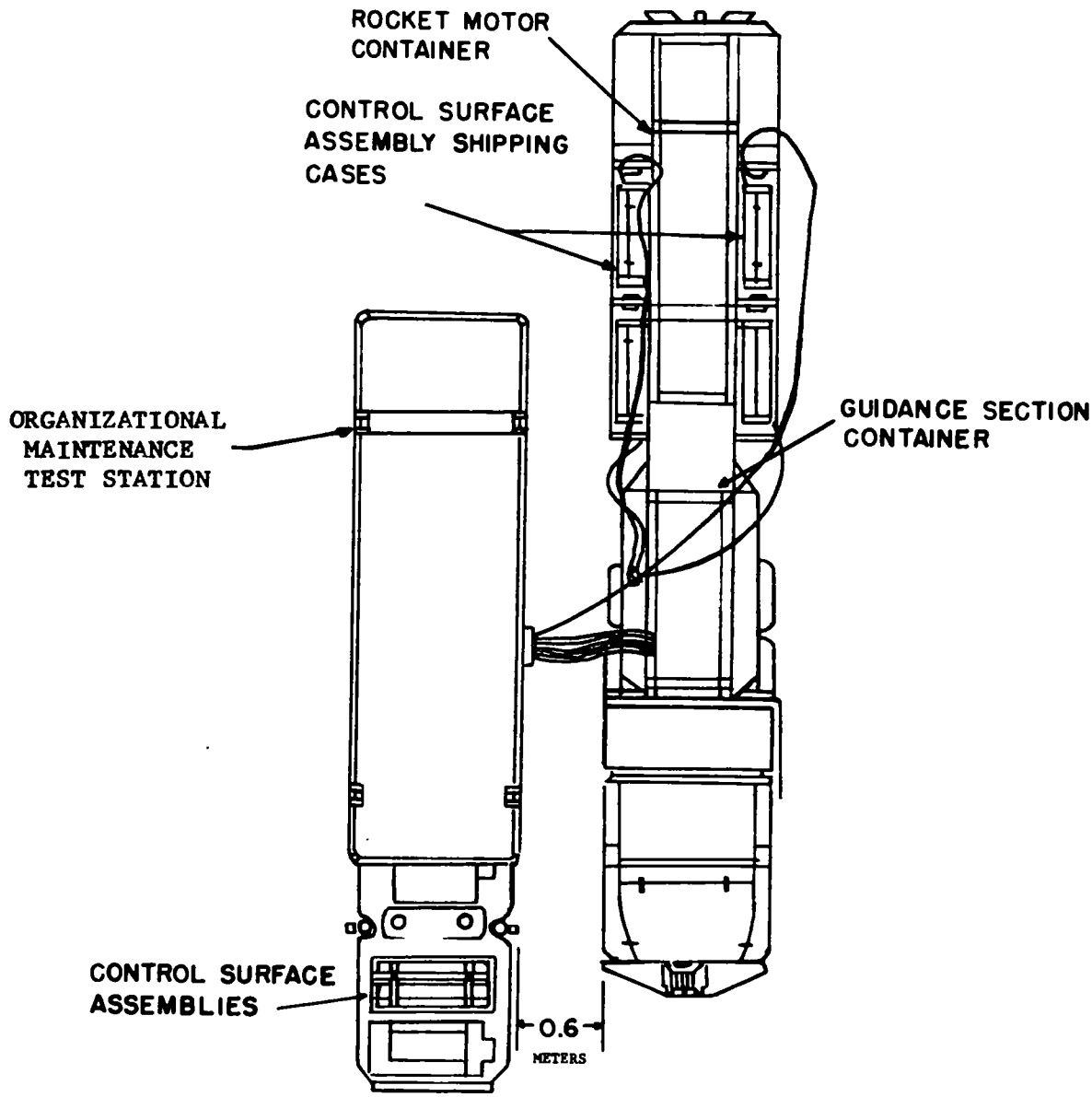
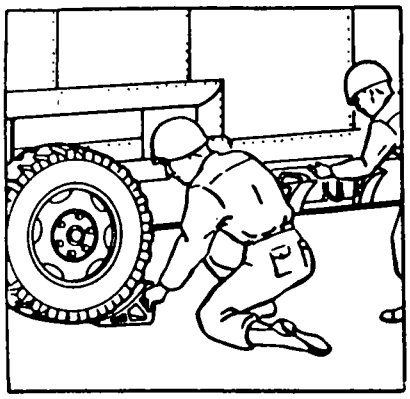
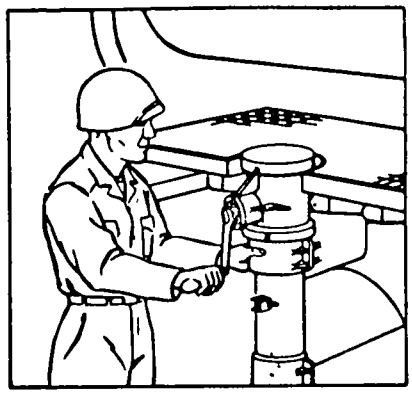


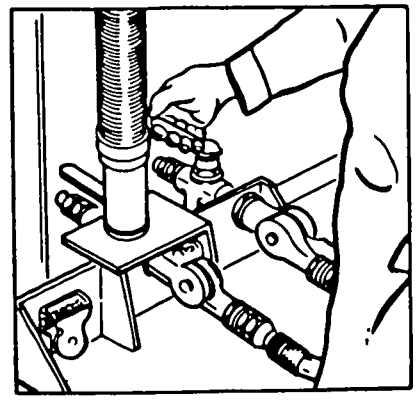
Figure 24. Transporter in position at organizational maintenance test station.



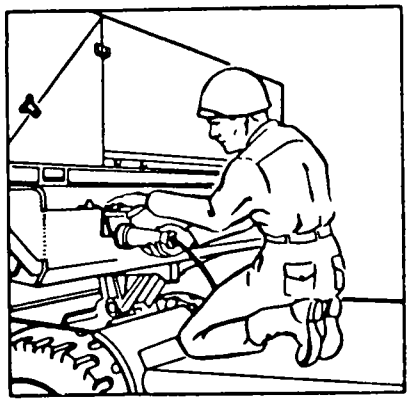
1. SET THE MECHANICAL PARKING BRAKES AND CHOCK THE WHEELS.



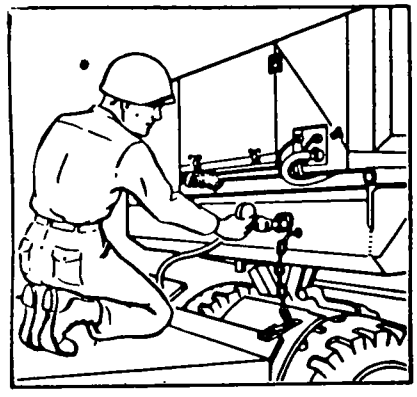
2. LOWER THE LANDING GEAR ON BOTH SIDES OF THE TEST STATION UNTIL THE TEST STATION WEIGHT IS TAKEN OFF THE PRIME MOVER. IF THE GROUND IS SOFT, ADD PLANKS, LOGS, OR ROCKS UNDER THE LANDING GEAR TO KEEP THE GEAR FROM



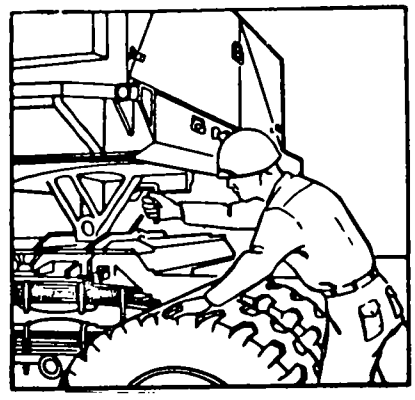
3. ROTATE THE PRIME MOVER AIR VALVES TO THE CLOSED POSITION.



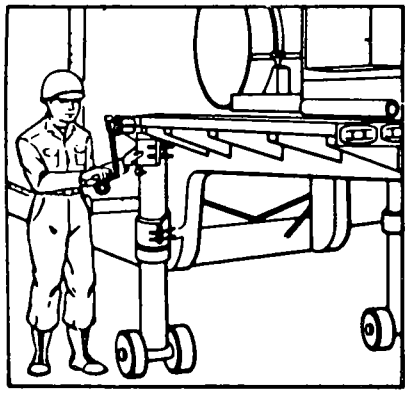
4. DISCONNECT THE PRIME MOVER ELECTRICAL PLUG FROM THE TEST STATION.



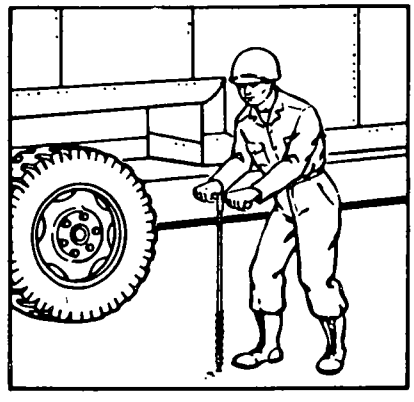
5. DISCONNECT THE TWO PRIME MOVER AIR-BRAKE CONNECTORS. REPLACE THE DUST COVERS ON THE AIR LINES. TO KEEP THE SERVICE BRAKES APPLIED, DO NOT DRAIN THE AIRBRAKE RESERVOIR.



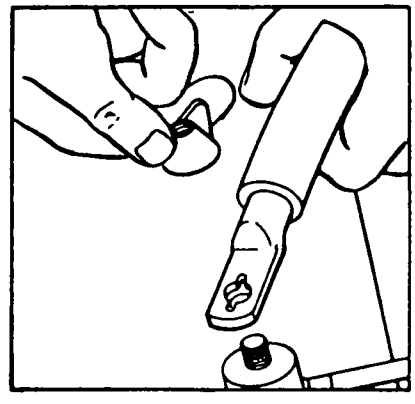
6. MOVE THE FIFTH-WHEEL SAFETY LOCK AND PULL THE FIFTH-WHEEL RELEASE HANDLE. THEN DRIVE THE PRIME MOVER AWAY.



7. LEVEL THE TEST STATION LENGTHWISE WITH THE LANDING GEAR. DO NOT ATTEMPT TO LEVEL THE TEST STATION SIDEWAYS WITH THE LANDING GEAR.

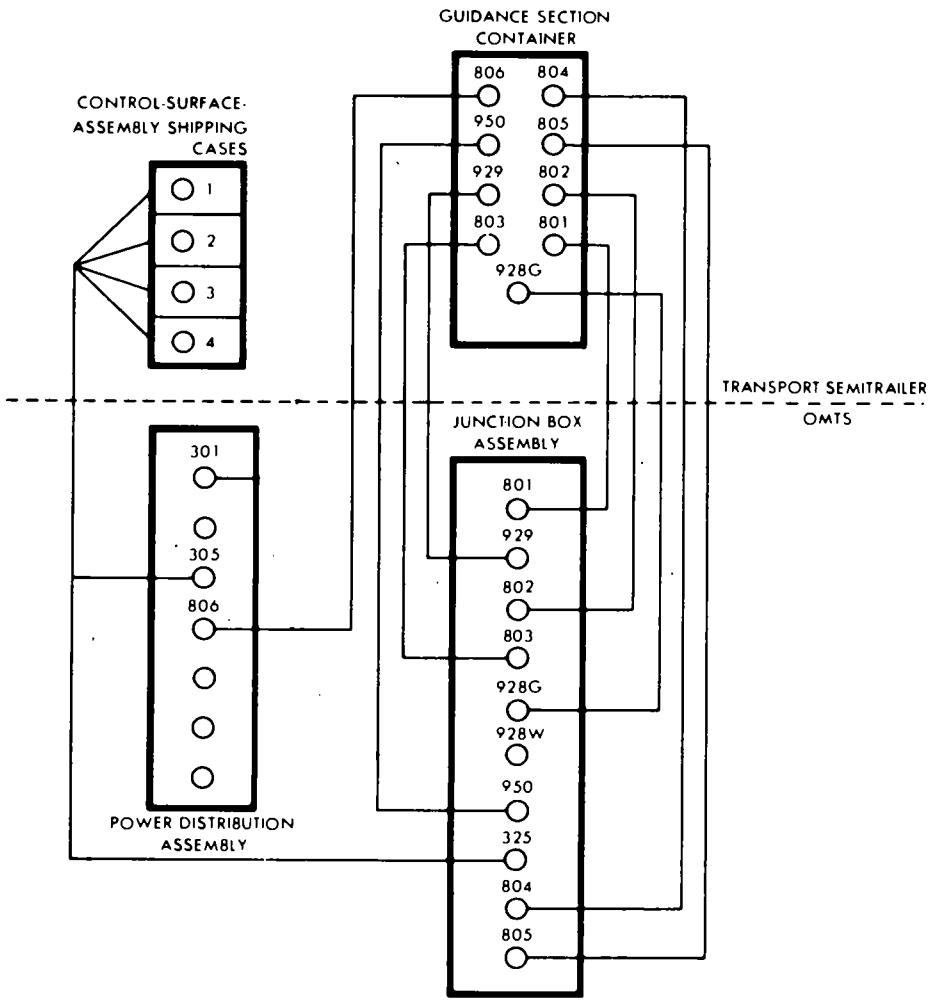


8. REMOVE THE GROUNDING STAKE FROM THE OUTSIDE FRONT WALL OF THE ENCLOSURE AND PUSH IT INTO THE GROUND.



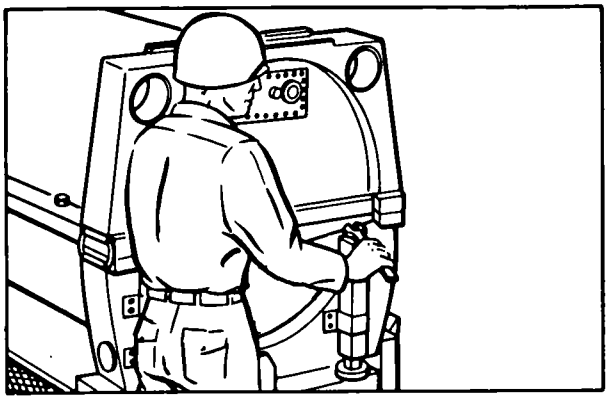
9. CONNECT ONE END OF THE GROUNDING CABLE (STORED INSIDE THE ENCLOSURE) TO THE WINGNUT ON THE STAKE AND CONNECT THE OTHER END TO THE WINGNUT ON THE SEMITRAILER FRAME NEAR THE LANDING GEAR.

Figure 25. Emplacing the organizational maintenance test station.



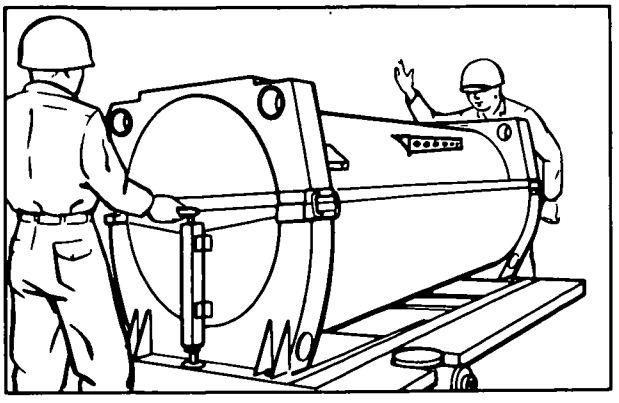
Interconnection diagram for testing the missile sections in their containers.

Figure 26. Interconnecting diagram.

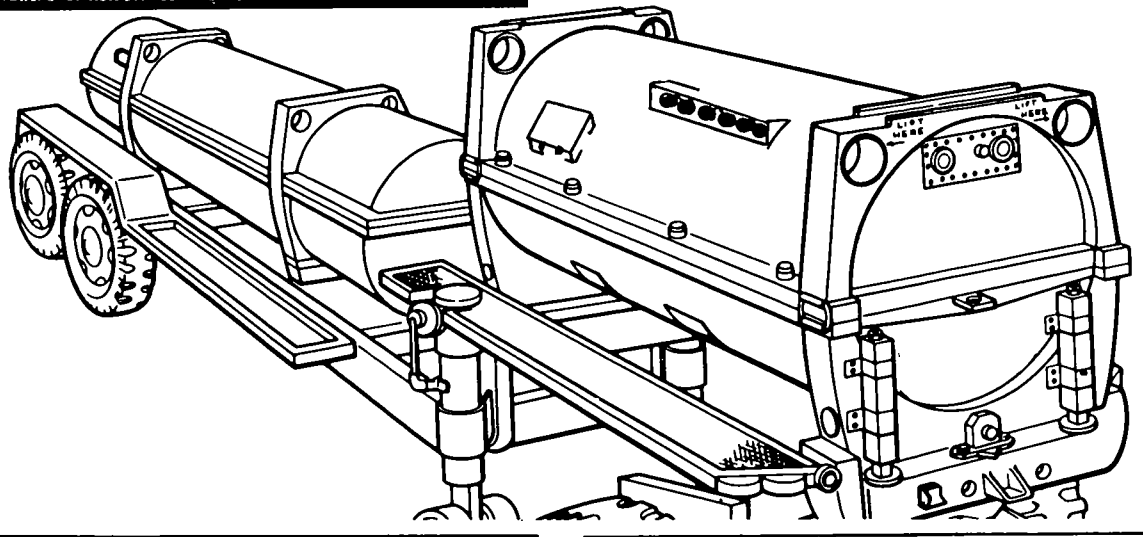


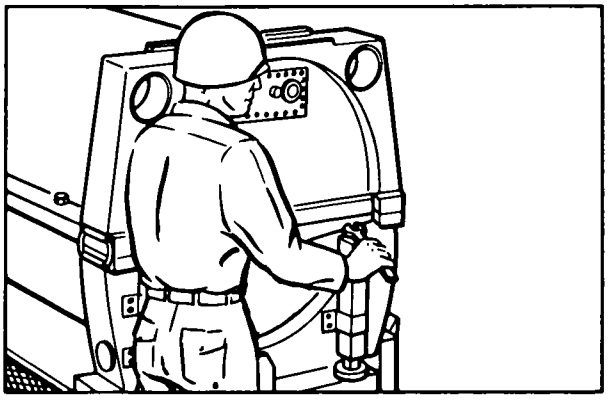
1. TURN THE HEXAGONAL BOLT HEAD ON TOP OF THE LEVELING JACKS IN A CLOCKWISE DIRECTION UNTIL THE JACKS ENGAGE THE JACKPADS ON THE SEMITRAILER FRAME.

NOTE. THE MONOBALL-BEARING ASSEMBLY AND THE ANCHOR-BOLT ASSEMBLIES MUST BE DISCONNECTED FROM THE TRAILER FRAME BEFORE THE LEVELING OPERATION IS BEGUN.

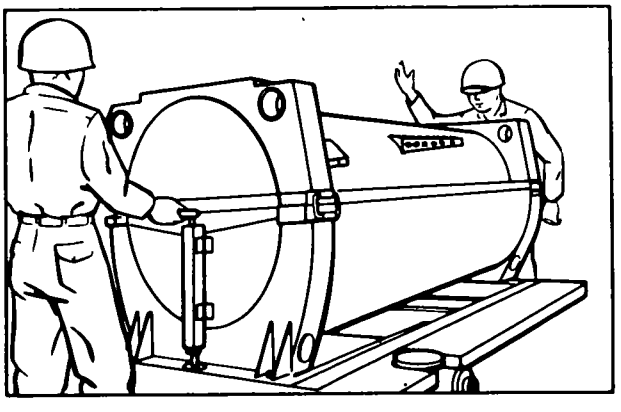


2. OPERATE THE REAR LEVELING JACK TO ADJUST THE PITCH OF THE CONTAINER. THE REAR LEVELING JACK OPERATOR RAISES OR LOWERS THE REAR END OF THE CONTAINER ACCORDING TO INSTRUCTIONS FROM THE FORWARD LEVELING JACK OPERATOR, WHO WATCHES THE LEVEL BUBBLE.





3. ADJUST THE ROLL OF THE CONTAINER BY OPERATING THE TWO LEVELING JACKS ON THE FORWARD END OF THE CONTAINER.



4. READJUST THE CONTAINER PITCH BY OPERATING THE REAR LEVELING JACK AS DESCRIBED IN STEP 2 ABOVE.

NOTE. REPEAT STEPS 2, 3, AND 4 UNTIL THE LEVEL BUBBLE IS WITHIN THE CIRCLE.

Figure 27. Leveling the guidance section container.

22. Guidance Section Test

Before the guidance section can be tested, the section container must be leveled and cabled as illustrated in figures 26 and 27.

Note. Be sure the container mounting bolts are loose before attempting to level the container.

a. Place the GUIDANCE READY switch on the power distribution assembly in the ON position. The GUIDANCE READY indicator must light. Set the control panel FUNCTION switch to the GUIDANCE SECTION position.

Note. If a self-test has been performed within the past hour and the TEST EQUIPMENT POWER switch has been left on, another self-test is not necessary.

b. Press the START button on the control panel. The test will progress automatically. If a failure occurs, refer to TM 9–4935–303–12 for the trouble-shooting procedure. Faulty assemblies are replaced in accordance with the procedures outlined in TM 9–1410–302–10. After the fault has been corrected, the FUNCTION switch on the control panel must be moved momentarily to the FINS or OMTS position and then back to the GUIDANCE SECTION position (TM 9–4935–303–12). This action is necessary to reset the stepping switches. Press the START button again to initiate a retest.

c. Place the GUIDANCE READY switch in the OFF position after the COMPLETE indicator on the control panel lights. Leave the TEST EQUIPMENT POWER switch in the ON position unless no further testing is to be performed.

23. Control Surface Assembly Test

The four control surface assemblies are identical and interchangeable. One, two, three, or all four assemblies can be tested during one FIN mode operation. However, if only one assembly is to be tested, the cable marked FLAP 1 must be used, and so on.

a. Place the FIN READY switch in the ON position. The FIN READY indicator must light. Set the FUNCTION switch on the control panel to the FINS position.

b. Press the START button on the control panel. After the COMPLETE indicator lights, place the FIN READY switch in the OFF position.

c. If troubles occur during the fins test, refer to TM 9–4935–303–12.

24. Assembly Replacement

The Sergeant missile system introduced a new concept to corrective maintenance by limiting repair of the missile by artillery personnel to the replacement of defective assemblies. The replacement of missile sections and control surface assemblies is briefly discussed below.

a. Rocket Motor. The rocket motor section cannot be tested by the organizational maintenance test station. Therefore, when the following conditions are observed or suspected, the entire section will be returned to the missile maintenance platoon for repair or replacement.

(1) Whenever the rocket motor has been dropped or severely bumped, whether in or out of its shipping container.

(2) Upon receipt of a rocket motor in a damaged shipping container.

(3) Whenever excessive moisture is indicated by the humidity indicator card on the shipping container.

b. Control Surface Assemblies. If one or more of the four control surface assemblies are defective, the defective assemblies will be replaced with replacement assemblies carried on the organizational maintenance test station. The defective assembly will be returned to the missile maintenance platoon for repair or replacement. The procedure for installing the new control surface assembly is as follows (fig. 28):

(1) Stand on the firing set inclosure and the gas turbine generator set to receive the control surface assembly from the ground.

(2) Retract the spring-loaded latch pin.

***Caution:* Do not force the spring-loaded latch during (3) below. The latch will seat when the control surface assembly is properly in place.**

(3) Engage the four guide pins on the control surface assembly with the bushings on the rocket motor. Carefully slide the control surface assembly forward, mating its connector with the connector on the rocket motor. Engage the latch pin with the control surface assembly.

(4) Set all control surface flaps to the UP position.

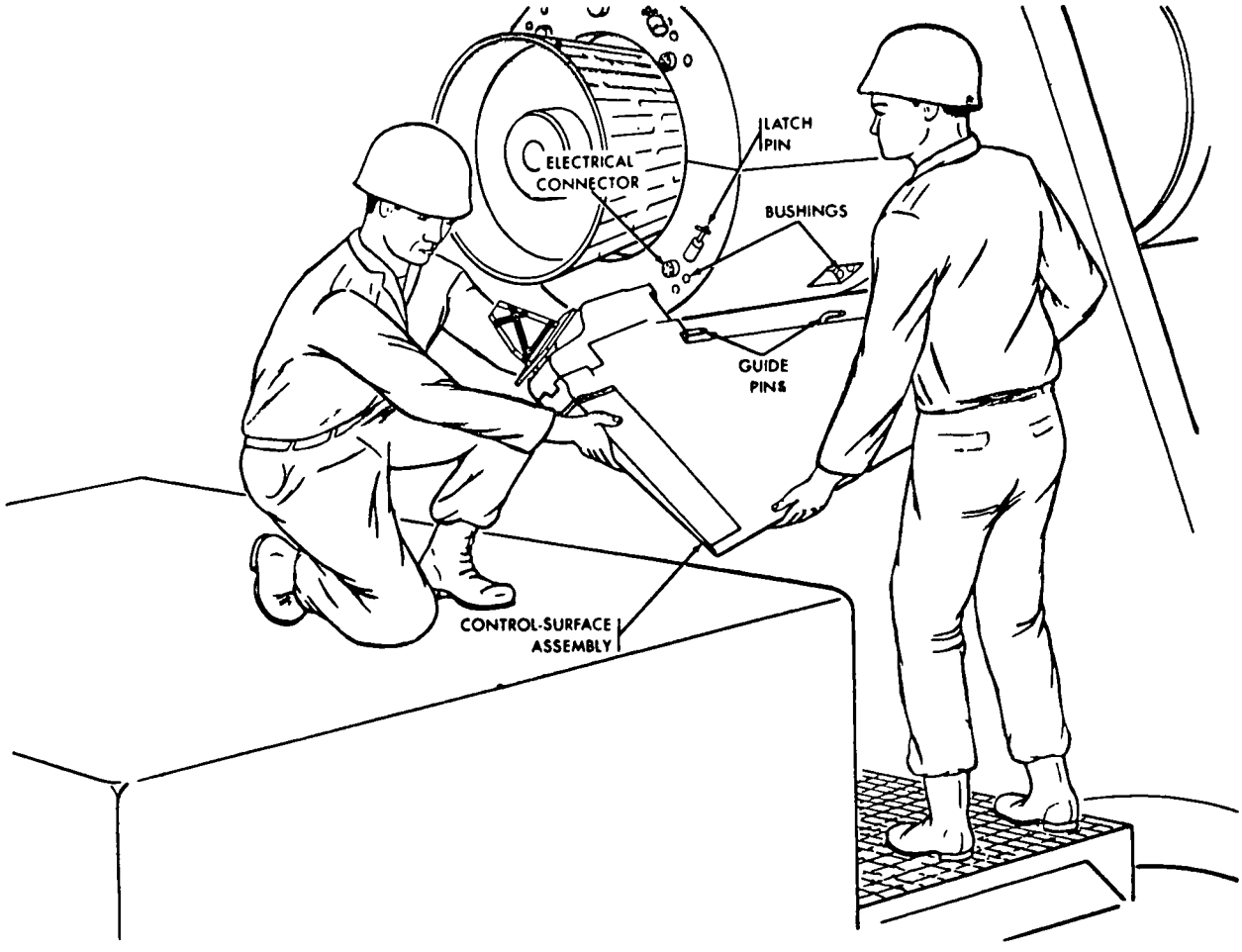


Figure 28. Installation of control surface assemblies.

c. Warhead Section. The warhead section cannot be tested at the organizational maintenance test station. For details on maintenance, see TM 9–1100–300–12.

d. Guidance Section. If a defective guidance section assembly is found while testing with the organizational maintenance test station, the missile test section personnel will replace the assembly. If tactical conditions permit, the guidance computer assembly, the guidance control assembly, and the guidance power supply assembly can be replaced with the guidance section in its container.

(1) The procedure for placing the guidance section in the organizational maintenance test station is as follows:

(*a*) Position the transport semitrailer for removal of the guidance section (fig. 29).

(*b*) Insure that the container mounting bolts are secure before opening the guidance section container.

(*c*) Open the guidance section container as described in TM 9–1410–302–20.

(*d*) Prepare the guidance section for removal from its container.

(*e*) Remove the guidance section from its container and install it in the organizational maintenance test station.

(*f*) Level the guidance section on the leveling jack assemblies.

(2) TM 9–1410–302–20 and TM 9–4935–303–12 should be used by the missile test station personnel for guidance in replacing defective assemblies in the guidance section.

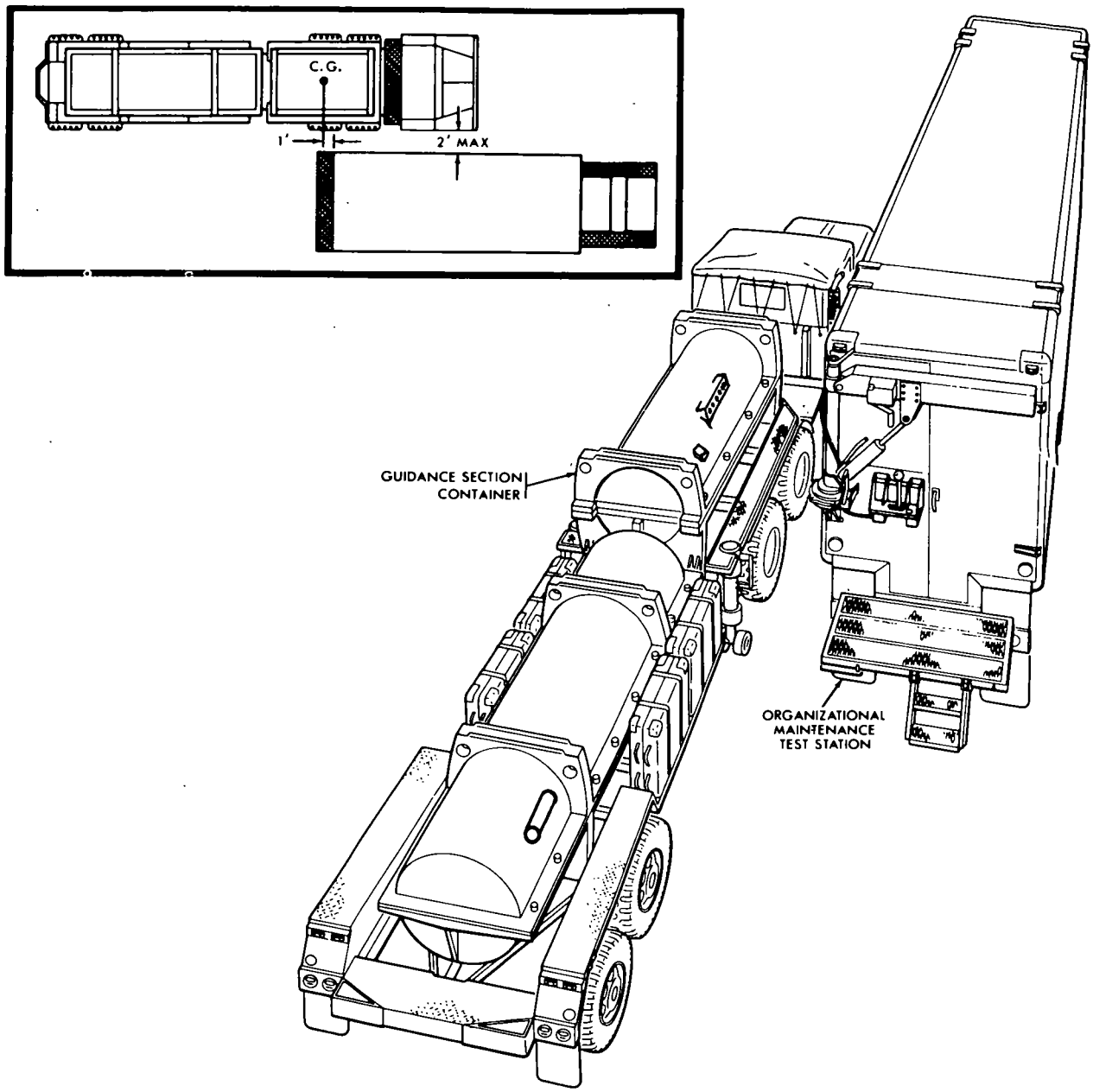


Figure 29. Emplacement of the transporter at the OMTS for removal of the guidance section.

25. March Order the Organizational Maintenance Test Station

a. Deenergizes the organizational maintenance test station.

b. Secure all equipment inside the organizational maintenance test station.

c. Make sure that all ventilator ports are closed against dust and weather.

d. Store cables after they have been cleaned and capped.

e. Shut down the gas turbine generator set.

f. Close all doors and fold the work platform and secure it for travel.

g. Remove and secure the ground stake. Turn off the fuel shutoff valve.

h. Couple the prime mover to the OMTS semitrailer if it has been uncoupled, raise the landing gear, then release the mechanical brakes, and store the wheel chocks.

CHAPTER 5

SITUATIONS REQUIRING SPECIAL ATTENTION

26. Holds

a. The term "hold" is defined as the suspension of the firing procedure and may be called at any time during the countdown prior to firing the missile. For specific instructions, see paragraph 13.

b. A hold may be requested by any individual connected with the firing activities.

c. When the command HOLD is called, the individual requesting the hold will announce the reason and, if possible, the length of time required before operations can be resumed.

d. The firing platoon commander will investigate the condition that caused the command to be given. He will determine the length of time necessary for the hold and report the conditions to the battery commander or battalion operations officer.

e. If the mission is *aborted* after X−20 seconds for any reason other than *WARHEAD HAZARD* indication, the missile should be returned to the horizontal position as quickly as possible. As soon as the cartridge actuating device is removed, two crewmen, wearing protective clothing, should disconnect and remove the activated missile primary wet battery assembly.

27. Misfires and Hangfires

a. A *misfire* is a failure of the propellant, igniter, or firing mechanism to function when the firing signal is generated. A *hangfire* is a temporary failure to function; that is, there is an unexpected delay between the time that the firing mechanism operated and the ignition of the propellant.

b. Since the difference between a misfire and a hangfire cannot be distinguished immediately, any failure to fire will be regarded as a hangfire.

28. Warhead Hazard — Indication and Procedure

a. General. If a warhead hazard is indicated in the firing set, a tone generator will generate a warning signal to all telephone communications.

b. Procedure. Proceed as indicated in TM 9–1100–300–12.

29. Emergency Procedures

For emergency procedures, refer to the appropriate technical manual as indicated in the appendix.

CHAPTER 6

MAINTENANCE AND INSPECTION

30. General

a. Maintenance and inspection are essential to insure that the section is prepared to perform its mission immediately. Systematic maintenance and inspection provide the best insurance against unexpected breakdown at the critical moment when maximum performance is essential.

b. Calibration service of special weapons test equipment will be provided by the supporting special weapons ordnance unit.

31. Disassembly, Adjustment, and Assembly

The disassembly, adjustment, and assembly of the firing platoon equipment authorized to be performed by battery personnel are prescribed in appropriate technical manuals, as indicated in the appendix, and supplemented by instructions contained in Department of the Army supply manuals. Deviation from these procedures is prohibited unless authorized by the responsible commander.

32. Records

The principal records pertaining to the missile are the missile equipment log and the launching station equipment logbook. Complete instructions regarding the procedure for making entries are specified in TM 38–750. The entries must be kept up to date, and the equipment logbook must accompany the missile at all times until the missile has been fired. The equipment logbook is then returned through channels for disposition.

33. Maintenance

Detailed instructions concerning the maintenance of missile ground support equipment are published in the appropriate technical manuals, as indicated in the appendix, and lubrication orders are furnished with each major item of equipment.

34. Inspections

Regular inspections are required to insure that the materiel is maintained in serviceable condition.

a. Each chief of section is responsible for the equipment within his section. He should make a general inspection each day. If he sees the need for repair or adjustment, he should notify the platoon or detail commander and the missile assembly technician immediately so that the necessary corrective action may be taken.

b. The platoon or detail commander, accompanied by the chief of section, should make a daily spot check inspection. The chief of section should inspect different parts of the materiel each day to insure complete coverage every few days. The platoon and detail commanders should make a thorough mechanical inspection of each major item of equipment as often as they deem necessary. This inspection should include auxiliary equipment, tools, and replacement items.

c. Battery, battalion, and higher commanders should make frequent command inspections to assure themselves that the equipment in their command is being maintained at prescribed standards.

d. Detailed instructions for inspecting the ground support equipment are contained in the appropriate technical manuals listed in the appendix.

e. Duties of individuals in performing the necessary inspections and maintenance of equipment within each section are assigned by the chief of section and coordinated and monitored by the missile assembly technician. Maintenance should be so organized that it can be accomplished effectively and rapidly. When the section is reduced in strength, the chief of section must reassign duties to insure that all maintenance is performed.

35. Inspection Before Operation (March)

The inspection performed before operation is a final check on materiel before leaving the motor park for training in the field or the bivouac area, for combat, or before displacement. After inspection and correction of all deficiencies, the equipment should be ready for operation.

36. Inspection During Operation (March)

The inspections performed during operation are constant checks on the functioning of the vehicles and the security of all transported equipment.

37. Inspection During Halt

The inspection at the halt is made at the dis-

cretion of the unit commander. The halt provides the personnel an opportunity to inspect for malfunctions that cannot be detected during movement.

38. Inspection and Maintenance After Operation

Immediately after operation, all equipment is serviced and maintained in preparation for further sustained operation and is inspected to determine the need for maintenance by higher echelons. These inspections may be performed in the position area by the missile assembly technician and the chief of section.

39. Periodic Inspection

a. Periodic inspections and maintenance are performed on vehicles and equipment, whether in garrison or combat.

b. The chief of section supervises the daily inspection and maintenance of section equipment.

c. Maintenance is a command responsibility.

CHAPTER 7

DECONTAMINATION

40. General

a. Contamination. Equipment which has been contaminated by chemical, biological, or radiological agents constitutes a danger to personnel. *Contamination* means the spreading of an injurious agent in any form and by any means. Persons, objects, or terrain may be contaminated.

b. Decontamination. Decontamination is the process of covering, removing, destroying, or changing the contaminating agent or agents into harmless substances. Generally, only equipment contaminated by persistent agents need be decontaminated.

41. Decontamination for Chemical Agents

The procedure for removing chemical agents from equipment is to wipe off visible contaminant with rags, apply DANC solution (decontamination agent, noncorrosive, M4), wipe with solvent soaked rags, and then dry (FM 21–40). If DANC is not available, the equipment should be scrubbed with soap and cool water and then all parts should be carefully dried. If the equipment cannot be decontaminated in the battery area, it must be evacuated to an echelon where decontamination or disposal can be accomplished in accordance with local regulations.

CHAPTER 8

DESTRUCTION OF MATERIEL

42. General

a. Procedures for the destruction of common materiel, including authority, destruction areas, precautions, methods available, plans, and training, and the procedures for the destruction of special types of equipment are contained in FM 5–25. The principles and procedures in FM 5–25 apply to the Sergeant system. Only those items not covered in FM 5-25 will be discussed in this chapter.

b. Destruction of the Sergeant missile system and related materiel will be effected when the equipment is subject to possible capture or abandonment in combat zone. The conditions under which equipment will be destroyed involve command decisions related to the tactical situation. Destruction of materiel will be effected by the using troops only when they are directed to do so by their unit or higher commander. The specific destruction procedures are contained in pertinent technical manuals as indicated in the appendix.

43. Possible Conservation of Mobile Units

Major units of the firing battery are housed or built into mobile vans and special semitrailers that can be quickly readied for evacuation. These units are extremely costly and difficult to replace. Therefore, every effort should be made to evacuate as many of these vans and trailers as possible.

44. Methods of Destruction

Selection of the method of destruction most suited to the Sergeant firing battery will require utilization of materials immediately at hand. Several means of destruction are generally available to the battery, and materials needed for destruction are easily found in the Sergeant installation. These mechanical means include axes, sledge hammers, and similar heavy implements. Gasoline, oil, and other flammables are suitable for burning materials. Destruction may also be effected by using explosives, such as 1-pound blocks of TNT readied for insertion into critical spaces. If available, gunfire, including artillery, antitank weapons, machineguns, and rifles with rifle grenades, may be used for destruction. Incendiary grenades and hand grenades may be used.

45. Destruction of Essential Parts

a. General. If evacuation becomes necessary and destruction is ordered, equipment that cannot be evacuated must be so thoroughly damaged that it cannot be restored to a usable condition in the combat zone by either repair or cannibalization. Adequate destruction requires that all parts essential to the operation of the system, including replacement parts, be destroyed. When lack of personnel and time prevents destruction of all essential parts, priority is given to the destruction of those parts most difficult to replace. When several units of identical equipment are being destroyed, the same essential parts must be destroyed on each so that the enemy cannot construct a usable unit from several damaged units. Because of the complexity of the Sergeant missile system, almost every unit is vital to its operation. Certain units are more easily fabricated than others; when time is limited, priorities must be assigned to destroy those units most difficult to reproduce.

b. Missile.

(1) *General.* It is preferable to completely destroy some sections of the missile rather than to partially destroy all sections of the missile. Destruction of the missile will be accomplished only upon the order of the senior person present in the unit. Priorities for destruction should be established as follows:

(*a*) Classified technical manuals.

(*b*) The warhead section.

The warhead section requires special handling; refer to TM 9–1100–300–12 for instructions on the destruction of the warhead section.

(2) *Guidance section.*

(*a*) Demolition by using explosives is the most effective way of destroying the guidance section. If the guidance section is in its container, open the container and remove the section covers. Detonate explosive charges in the drag brake compartment and among the guidance assemblies.

(*b*) When the use of explosives is not possible, use a heavy object and smash the guidance assemblies; and then pour gasoline over all the section. Ignite incendiary grenades inside the guidance assemblies and the drag brake compartment.

(3) *Rocket motor.* Do not attempt destruction of the rocket motor by burning. Wrap primacord around the motor case or set up shaped charges to rupture the motor.

(4) *The control surface assemblies.* Use gunfire to destroy control surface assemblies or smash the assemblies with a pickax.

(5) *Cabling.* Use a heavy ax to cut up the cabling, and then burn by using gasoline.

c. Launching Station. The launching station may be destroyed by burning, by demolition, or by gunfire. It is important that the same essential parts on each unit be completely destroyed so that the enemy cannot construct a complete unit from two or more damaged units.

(1) *Burning.* Use an ax, pick mattock, sledge, or other heavy implement to smash all vital parts. Then pour gasoline or hydraulic fluid over the entire launching station and light the fire from a safe distance, using a train of flammable material.

(2) *Demolition.* Smash all vital parts and then place 10 explosive charges as follows:

(*a*) Place the first charge on the turntable.

(*b*) Place the second charge at the top of the boom support and tape the charge to the hydraulic line.

(*c*) Place the third charge inside the firing set and tape it to the electronic assemblies.

(*d*) Place the fourth and fifth charges between the wheels on each side of the launcher.

(*e*) Place the sixth charge on the trailer control panel.

(*f*) Place the seventh charge on the trolley.

(*g*) Place the eighth charge on the cable reel.

(*h*) Place the 9th and 10th charges between the trailer frame and the wheels on each side of the launcher.

(*i*) Connect the 10 charges together with a detonating cord for simultaneous detonation.

(*j*) Destroy the tires by placing an incendiary grenade under each tire.

(3) *Gunfire.* Use artillery, machineguns, rifles with rifle grenades, or launchers with antitank rockets to destroy by gunfire. Gunfire is the most unsatisfactory method of destruction because distance is required and destruction is not always complete.

d. Other Equipment. For other major pieces of equipment, see the pertinent technical manuals as indicated in the appendix.

Warning: **All safety precautions should be exercised in handling demolition explosives and flammable materials. If gasoline is to be used in the destruction, consideration should be given to the highly flammable nature of the gasoline and its vapors. Carelessness in its use may result in explosions and painful burns. If destruction is to be accomplished with demolition materials, all units to be destroyed should be completely disconnected from sources of electrical energy and grounded prior to placing the explosives. This will lessen the possibility of injury to personnel from contact with high-voltage conductors or from premature detonation of explosives primed for electrical ignition.**

Note. Assemble demolitions in accordance with FM 5–25. In general, destruction of essential parts followed by burning will be sufficient to render the Sergeant missile useless. It is important that destruction of units of the Sergeant missile system be accomplished in a manner that will insure the security of all classified components.

CHAPTER 9

SAFETY PRECAUTIONS

46. References

Safety precautions to be observed are prescribed in AR 385–62.

47. Purpose and Scope

The purpose of this chapter is to outline the more important safety precautions to be observed by personnel in the Sergeant firing battery. Emphasis is placed on precautionary measures required to avoid bodily injury caused by hydraulic pressure or electric shock. Included in this chapter is a summary of first aid treatment for electric shock.

48. Principles

The cardinal safety principle to be observed in operations involving explosives, toxic agents, and fire hazards is to limit the exposure time of a minimum number of personnel to a minimum amount of hazardous material consistent with safe and efficient operation. This principle implies that –

a. Hazardous working areas be separated from all other areas.

b. The minimum number of personnel needed for efficient operation be employed in hazardous working areas.

c. Only the necessary amount of hazardous material be present in the working area.

Note. For detailed information about warhead safety, refer to TM 9–1100–300–12.

49. Solid Propellant Motors

The safety precautions for handling solid propellant motors do not differ greatly from those for handling artillery ammunition of similar size and weight. Rocket motors must be treated in the same manner as artillery propelling charges, which are sensitive to friction, flame, and sparks. If improperly handled or stored, propellants may become highly explosive. The propellants should not be used if it is suspected that it may have been dropped or otherwise severely jarred. A crack in a solid propellant motor may cause sufficient chamber pressure to result in an explosion when the propellant is ignited.

a. Personnel working with the propellant should be aware of the safe temperature range. Storage temperature should always be within the limits prescribed by ordnance or the manufacturer of the propellant. For additional information, refer to TM 9–1410–302–20 and appropriate technical bulletins.

b. All propellant igniters will be handled in accordance with manufacturer's specifications and/or ordnance instructions. Specifically, items that use shorting assemblies will not be disconnected until the igniter is fixed in the missile and all appropriate precautions have been taken.

c. Smoking will be prohibited within 18 meters of the launching station and storage areas. Smoking will also be prohibited on any vehicles used in transporting the propellants or explosives. The possession of matches or other flame-producing devices will be prohibited in no-smoking areas.

50. First Aid for Electrical Shock

A brief outline of the steps necessary to begin rescue and first aid for a person suffering from electrical shock is given below. This outline is very general and does not give the details for administering artificial respiration. The time to become proficient is *now*, before it is needed, because personnel will not have time to learn after an accident occurs.

a. Rescue. Shut off the high-voltage source and ground the circuits. If the high-voltage source cannot be turned off without delay, free the victim from contact with the live conductor. However, avoid direct contact with the live conductor or the victim's body. Use a dry board, dry clothing, or other nonconductor (ax, shovel, rake) to free the victim. An ax with a dry wooden handle may be used to cut the high-voltage wire. Use extreme caution to avoid injury from the resulting electric flash.

b. Symptoms.

(1) Normal breathing stops.
(2) The victim is usually very white or blue.
(3) The pulse is weak or absent and the victim is unconscious.
(4) Burns are usually present.
(5) The victim's body may become rigid or still in a very few minutes. This condition

is due to the action of electricity and is not to be considered rigor mortis.

c. Treatment.

(1) Start artificial respiration immediately.
(2) Send for a doctor if assistance is available.
(3) Do not leave the victim unattended.
(4) Keep the victim warm to lessen the degree of shock.
(5) Perform artificial respiration at the scene of the accident, unless the victim's or operator's life is endangered by such action. If it is necessary to move the victim, move him no farther than necessary for safety.

51. Hydraulic Safety

Hydraulic pressure is used for many purposes, such as lifting and swinging great weights, in Sergeant peculiar equipment. The following precautions should be observed by personnel in the area where hydraulic power is being used:

a. Personnel must stay clear of a load being lifted. Hydraulic lines may rupture or pumps may fail and the load could drop suddenly.

b. Personnel should stand clear of hydraulic lines. A ruptured hydraulic line will spew fluid which can blind or burn.

c. The slewing or swinging of a boom is accomplished by using hydraulic power, and personnel must remain out of the path of the boom.

52. Battery Electrolyte Safety

At X—20 seconds in the countdown, the primary wet battery assembly is activated. If the mission is aborted after X—20 seconds, the primary wet battery assembly will spew its electrolyte and will have to be replaced. Crewmen should wear protective clothing and guard against becoming contaminated by the electrolyte when removing the activated battery. If contamination does occur, the exposed personnel must immediately wash the skin area with cool clean water and cover the area with a mild acetic acid (vinegar) solution, if available. If the acetic acid solution is not available, they should continue to gently wash the contaminated skin area with cool clean water and report to the medical aidman as soon as possible.

CHAPTER 10

TRAINING

53. Purpose and Scope

The purpose of this chapter is to present the minimum requirements for training the personnel of a firing platoon in the performance of their duties. The training requirements are based only on the material contained in the text of this manual. This chapter includes general information on the conduct of training.

54. Objectives

The objectives are to train crewmen to perform their individual duties rapidly and, through drill, to form them into an effective, coordinated team that is able to function efficiently in combat.

55. Conduct of Training

a. Training will be conducted in accordance with the principles in FM 21–5 and FM 21–6. The training goal is outlined in ATP 6–555 and in AR 611–201.

b. In general, individual training is conducted by noncommissioned officers as far as practicable. Officers are responsible for preparing training plans, for conducting unit training, and for supervising and testing individual training.

c. Throughout training, the application or prior instruction to current training must be emphasized.

d. A record of training received by each individual should be kept on a progress card, which may be maintained by each chief of section for each crewman in his section. This card should show each period of instruction attended, tests taken, and remarks pertaining to progress. Progress cards should be inspected frequently by the battery commander to be sure the cards are being kept properly and to determine the state of training. *Requiring the chief of section to keep these records emphasizes his responsibility toward his section.*

e. The firing platoon must be able to perform the operations prescribed in this manual equally well during daylight and under blackout conditions. Night training under blackout conditions must be stressed.

f. Realistic training is especially important for a guided missile unit. Simulating essential operations because of safety, the labor involved, or the complex nature of the equipment must be avoided. Maximum use should be made of mock firings of training missiles to include section drills on –

(1) Transfer of missile sections to the launching station and assembly of the missile.
(2) Checkout of missile sections at the organizational maintenance test station.
(3) Prefire procedures at the launching station.
(4) Countdown and firing (mock included).
(5) Survey by time and accuracy.
(6) Communications. Communication training should emphasize the establishment and operation of wire nets, and the importance of alertness and promptness in decoding incoming messages and encoding outgoing messages.

56. Standards to be Obtained

The qualifications established in AR 611–201 should be used as a guide for standards to be obtained by individuals. The qualifications established in ATT 6–555 should be used as a guide for standards to be obtained by Sergeant units.

CHAPTER 11

TESTS FOR QUALIFICATION OF MISSILEMEN

57. Purpose and Scope

This chapter prescribes the tests to be given in the qualification of missilemen. The tests are designed to measure a soldier's knowledge of all major components in the Sergeant missile system; they do not require a technical background or school training. Successful completion of these tests qualifies an individual for award of the missile qualification badge in the degree of proficiency shown in paragraph 60. The purposes of the test are to —

a. Provide a means of determining the relative proficiency of the individual artillery soldier in the performance of duties required of members of the Sergeant firing battery. The tests will not be a basis for determining the relative proficiency of batteries.

b. Serve as an incentive for individuals within the Sergeant firing battery to expand their knowledge of the complete Sergeant missile system, thereby increasing their value to the unit.

c. Serve as an adjunct to training.

58. Standards

The examinee will be required to perform the tests in accordance with the procedures listed in this manual and the appropriate technical manuals. In those tests in which an examinee is required to direct assistants, he will do so in the manner of a noncommissioned officer, regardless of his actual rank. Although time limits have not been imposed for these tests, an obvious display of technical inefficiency (fumbling, uncertainty) or trial and error solutions will be cause for halting a test and failing the examinee.

59. Qualification Test

a. The tests below have been prepared in an endeavor to standardize the requirements for the awarding of the missile qualification in all units. Although these tests do not include all possible areas of interest, successful completion of the tests should insure a qualified missileman.

Area	Test	Maximum credit
I	Missile (18 points total) (6 tests):	
	1. Can the examinee demonstrate the proper opening/closing procedures for section containers?	3
	2. Can the examinee explain the proper procedures for emergency destruction?	3
	3. Can the examinee satisfactorily direct the missile guidance transport trailer to its recommended location at the launching station and at the organizational maintenance test station?	3
	4. Is the examinee familiar with the missile technical manuals (TM 9–1410–302–20 and TM 9–1100–300–12)?	3
	5. Is the examinee familiar with the special tools that are available for maintenance (TM 9–1410–302–20) and their use?	3
	6. Is the examinee familiar with the rocket motor sling assembly, guidance section handling fixture, and warhead section strongback?	3
II	Azimuth Orientation System (15 points total) (5 tests):	
	1. Can the examinee properly emplace the traverse target and reference theodolite?	3
	2. Can the examinee operate the reference theodolite accurately?	3
	3. Can the examinee operate the azimuth orientation unit accurately and install the alinement tube properly?	3
	4. Is the examinee familiar with the alinement plate check, theodolite plunge check, and collimation target check?	3
	5. Is the examinee familiar with the appropriate technical manuals (TM 9–1440–301–12 and TM 5–5575–205–15)?	3
III	Launching Station (22 points total) (5 tests):	
	1. Does the examinee understand the functions of all crew members during emplacement, assembly, disassembly, and march order?	8
	2. Does the examinee perform proficiently the functions of the boom operator and recognize and understand the appropriate hand signals?	5
	3. Can the examinee properly level the launching station and does he know how to perform a load test of the hoisting system?	3
	4. Is the examinee familiar with the communication equipment on the launching station and the proper radiotelephone procedures?	3
	5. Is the examinee familiar with the technical manual for the launching station (TM 9–1440–301–12)?	3

Area	Test	Maximum credit
IV	Firing Set (15 points total) (5 tests):	
	1. Can the examinee perform a self-test of the firing set?	3
	2. Can the examinee correctly insert all necessary information for a fire mission?	3
	3. Does the examinee understand the use of the TEST OPERATE switches, azimuth control panel, operator control panel, and monitor control panel?	3
	4. Can the examinee properly test the remote firing box?	3
	5. Is the examinee familiar with the appropriate technical manual for the firing set (TM 9–1440–301–12)?	3
V	Organizational Maintenance Test Station (15 points total) (5 tests):	
	1. Can the examinee properly conduct a self-test of the organizational maintenance test station?	3
	2. Can the examinee properly connect the required cables to the guidance section container and the individual fin containers?	3
	3. Can the examinee properly operate the jib crane?	3
	4. Is the examinee familiar with the organizational maintenance test station control panel, air-conditioning system controls, and guidance test procedures?	3
	5. Is the examinee familiar with the appropriate technical manual for the organizational maintenance test station (TM 9–4935–303–12)?	3
VI	Gas Turbine Generator Set (15 points total) (5 tests):	
	1. Does the examinee know the proper preoperation checks?	3
	2. Is the examinee familiar with the control panel?	3
	3. Can the examinee start and stop the equipment and utilize proper procedures for false starts?	3
	4. Does the examinee know where the danger areas are around the equipment?	3
	5. Is the examinee familiar with the technical manual for the equipment (TM 5–6115–320–12 or TM 5–6115–294–12)?	3
	Maximum possible total	100

b. Successful completion (without fumbling and uncertainty) of each test entitles the examinee to maximum credit. Mistakes, discrepancies, or other examples of poor performance should be weighted accordingly. For example, if the examinee successfully completes a test, but only after having received some guidance or having evidenced stumbling or uncertainty, he should receive a one- or two-point deduction. If he fails to complete a test, he should receive no credit.

60. Qualification Scores

Minimum scores required for qualification of missilemen are as follows:

Expert missileman	90 points
First-class missileman	80 points
Second-class missileman	70 points

61. Assistance

The examinee will receive no unauthorized assistance. Assistants will be furnished to the examinee as required for each test. The assistants will perform duties as they are assigned by the examinee. Assistants will not volunteer information but will execute the examinee's commands to the best of their ability. When erroneous commands are given, the assistants should so inform the examiner prior to acting on the command. If an examinee fails a test because of the fault of the examiner or an assistant, the test will be disregarded, and the examinee will be given another test of the same nature.

62. Conduct of Tests

At the start of a test, the condition of the equipment should be the same as it would be during normal operation. The examiner will explain to the examinee the scope of the test and indicate the men who will act as assistants. The examiner will also furnish the examinee with any checksheets or related materials required. During the test, the examiner will insure that the examinee makes no mistakes which would be harmful to personnel or equipment. At the completion of the test, the examiner will critique the examinee's performance and turn in a tentative score to the battery commander, who will question the examinee and the examiner as to the reasons for the examiner's tentative score. The battery commander will finalize the score and forward the test score to battalion.

APPENDIX

REFERENCES

AR 190–60	Physical Security Standards for Nuclear Weapons.
AR 310–1	Military Publications — General Policies.
AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Codes.
AR 330–12	Effective Date of Change of Strength Accountability.
AR 335–60	Morning Reports (Reports Control Symbol AG–140) (R3).
AR 385–62	Firing Guided Missiles and Heavy Rockets for Training, Target Practice, and Combat.
AR 385–63	Regulations for Firing Ammunition for Training, Target Practice, and Combat.
AR 600–20	Army Command Policy and Procedures.
AR 611–201	Manual of Enlisted Military Occupational Specialties.
AR 735-5	Property Accountability — General Principles and Policies and Basic Procedures.
AR 735-35	Supply Procedures for TOE Units, Organizations, and Non-TOE Activities.
DA Pam 108–1	Index of Army Motion Pictures, Filmstrips, Slides, Tapes, and Phono-Recordings.
DA Pam 310-series	Military Publications Indexes.
ATP 6–555	(Army Training Program) Field Artillery Missile Battalion, Sergeant.
ATT 6–555	(Army Training Test) Field Artillery Missile Battalion, Sergeant.
FM 5–20-series	Camouflage.
FM 6–2	Artillery Survey.
FM 6–10	Field Artillery Communications.
FM 6–20–1	Field Artillery Tactics.
FM 6–20–2	Field Artillery Techniques.
(C) FM 6–37	Field Artillery Missile Battalion, Sergeant (U).
FM 6–40	Field Artillery Cannon Gunnery.
(C) FM 6–40–2	Field Artillery Missile Gunnery (U).
FM 6–121	Field Artillery Target Acquisition.
FM 6–140	Field Artillery Cannon Battalions and Batteries.
FM 21-5	Military Training Management.
FM 21–6	Techniques of Military Instruction.
FM 21–30	Military Symbols.
FM 21–40	Small Unit Procedures in Chemical, Biological and Radiological (CBR) Operations.
FM 21–60	Visual Signals.
FM 22–5	Drill and Ceremonies.
FM 24–18	Field Radio Techniques.
FM 24–20	Field Wire and Field Cable Techniques.
FM 30–7	Combat Intelligence Battle Group, Combat Command, and Smaller Units.
(CM) FM 32–5	Communications Security (U).
FM 100–5	Field Service Regulations — Operations.
FM 101–5	Staff Officer's Field Manual; Staff Organization and Procedure.
FM 101–10 parts 1 and 2	Staff Officer's Field Manual; Organizational, Technical and Logistical Data.
FM 101–31–1, and –3	Staff Officer's Field Manual; Nuclear Weapons Employment.
(S) FM 101–31–2	Staff Officer's Field Manual; Nuclear Weapons Employment (U).
TM 5–236	Surveying Tables and Graphs.
TM 5-241–1	Grids and Grid References.
TM 5–241–2	Universal Transverse Mercator Grid: Zone-to-Zone Transformation Tables.
TM 5–4120–222–15	Operator, Organizational, Field, and Depot Maintenance Manual: Air Conditioner: Lightweight, Basic Unit, 208V, 3 Phase, 18,000 BTU.
TM 5–6115–294–12	Operator and Organizational Maintenance Manual: Generator Set, Gas Turbine Engine, 30 kw, ac, 120/208 v, 3 Phase, 400 Cycle: Skid Mounted (Sperry Utah Engineering Laboratories Model GTGE 70–2–1) FSN 6115–778–8788.
TM 5–6115–320–12	Operator and Organizational Maintenance Manual: 45 kw Gas Turbine Engine Generator Set.
TM 5–6675–205–15	Operator Maintenance Manual Theodolite: Directional, 0.002 Mil Graduation, 5.9 in. Long Telescope Detachable Tribach w/Accessories Tripod (Wild Heerbrugg Model T–2–56–C–Mil) FSN 6675–682–4635 (Wild Heerbrugg Model T–2–56–M–Mil) FSN 6675–796–9439.

TM 5–6675–207–15	Operator, Organizational, Field and Depot Maintenance Manual: Surveying Instrument Azimuth: Gyro; Artillery; with Gyroscope Housing, Electronic Null Indicator and Mounting Base (Autonetics Model ABLE C2A) Serial Nos. .A001 through A124, FSN 6675–606–3378.
TM 5–6675–233–15	Operator's Organizational Field and Depot Maintenance Manual: Theodolite: Directional, 0.002-Mil Graduation, 5.9 in. Long Telescope, Detachable Tribrach; w/Accessories and Tripod (Wild Heerbrugg Model T-2 63–M–Mil) FSN 6675–983–8027.
TM 6–230	Logarithmic and Mathematical Tables.
(S) TM 9–1100–300–12	Operator and Organizational Maintenance Manual (Prefire Procedures): Warhead Sections XM62 and XM63 (U).
TM 9–1410–302–20	Organizational Maintenance Manual: Sergeant Artillery Guided Missile XM15 (Sergeant Artillery Guided Missile System).
TM 9–1440–301–12	Operator and Organizational Maintenance Manual: Four-Wheel Semitrailer-Mounted Guided Missile Launching Station XM504 (Sergeant Artillery Guided Missile System).
TM 9–2330–300–14	Operator, Organizational, and Field Maintenance Manual for Semitrailer, Low Bed: 6-Ton, 4-Wheel, XM527 (2330–714–3303) and Chassis, Semitrailer; 6-Ton, 4-Wheel, XM539 (2330–712–8542).
TM 9–4935–303–12	Operator and Organizational Maintenance Manual: Guided Missile System Components Organizational Maintenance Test Station AN/MSM–35 (Sergeant Artillery Guided Missile System).
TM 38–750	Army Equipment Record Procedures.

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By Order of the Secretary of the Army:

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CRD (1)
COA (1)
CINFO (1)
TIG (1)
CNGB (2)
CAR (2)
USCONARC (5)
USACDCARTA (2)
LOGCOMD (1)
Armies (5)
MDW (2)
Corps (3)
Corps Arty (3)
Div (2)
Div Arty (2)
Bde (5)
FA Gp (2)
USMA (1)
Svc Colleges (2)
Br Svc Sch (2) except
USAAMS (26)
USATC: Armor, Engr, AD,
FA, Inf (2)
Units org under fol TOE:
6–555 (10)

NG: None.

USAR: None.

For explanation of abbreviations used, see AR 320–50.

Table I. Emplacement

Chief of section	Assistant chief of section	Crewman No. 1	Crewman No. 2	Crewman No. 3	Crewman No. 4	Crewman No. 5	Crewman No. 6 (heavy truck driver)	Boom operator	Senior azimuth orienting system (AOS)	Azimuth orienting system operator	Firing set operator
Indicates launcher position to assistant chief of section (AC/S). Supervises emplacement.						Drives the personnel vehicle to transport the crew into the area.					
	Directs crewman No. 6 (heavy truck driver) in positioning launching station blast shield over the survey stake.										
							Drives the launching station prime mover into position.		Obtains the azimuth of the orienting line (OL) from the section chief.		Turns off the air to the launcher trailer brakes.
		Sets the right hand brake.	Sets the left trailer handbrake.	Performs the preoperational check of the fuel system and GTGS as outlined in TM 5–6115–294–12 or TM 5–6115–320–16 and then stands by to start the turbine.	Assembles the ground stake and, assisted by crewman No. 5, drives the stake into the ground and attaches the grounding cable.	Assists crewman No. 4 with the ground stakes.		Disconnects the forward boom travel lock. Releases the blast shield travel locks.			Uncouples the airhoses and electrical intervehicular cable.
	Checks to see that the control valves and switches on the trailer are in their preoperating positions. Receives signals from the boom operator, crewman No. 3, and the firing set operator that they have made their preoperational checks. Checks to insure that the danger areas for turbine are clear. Directs crewman 3 to start gas turbine generator set (GTGS).							Insures that the control valves and switches on the boom are in their normal preoperating positions.			Lowers the firing set platform, opens the door to the firing set, and checks that the firing set power switches are in the OFF positions.
								Unlocks the rear boom travel lock.			Closes the door to the firing set and secures the firing set platform.
								Checks the fuel level gage and fuel tank cap valve.			
								Removes the fire extinguisher and stands by with it at the front (panel side) of the GTGS.			
				When signaled by the assistant chief of section, he starts the turbine.							
		Checks the hydraulic sumps.									
	Tests trailer control panel lights. Turns on hydraulic pumps and checks hydraulic pressure and indicator lights.	Removes the right outrigger arm from the travel lock, extends and locks it in the emplaced position.	Removes the left outrigger from the travel lock, extends the outrigger arm, and locks it in the emplaced position.	Assists crewman No. 1 with the right outrigger.	Assists crewman No. 2 with the left outrigger.						
	Places BLAST SHIELD VALVE in the LOCK DOWN position.	Removes the right outrigger jack pad and positions it beneath the outrigger jack.	Removes the left outrigger jack pad and positions it beneath the outrigger jack.		Releases and emplaces the rear jack pad.						
	Extends outrigger jacks enough to raise launching station off the fifth wheel of the prime mover.	Cleans the ball end of the jack and engages it with the jack pad.	Cleans the ball end of the jack and engages it with the jack pad.		Releases the rear jack travel latch after cleaning the ball end of the jack						Pulls the fifth wheel locking pin.
Directs AC/S and signals crewman No. 6 when to move the prime mover from the launching station.											
							On signal from the chief of section, he drives the prime mover from beneath the launching station.				
	Extends rear jack and levels launching station. Turns off trailer hydraulic system.				Engages the rear jack with the jack pad.						
								Tests the boom control panel lights.			
								Turns on the hydraulic pumps and checks the indicator lights.			
	Signals boom operator to raise U-frame to the fully extended position.							Operates the superstructure hydraulic system as directed by the assistant chief of section.			
		Locks the right frame actuator.	Locks the left frame actuator.							Assisted by the azimuth orientation system (AOS) operator, he sets up the AOS equipment and installs the necessary communications.	Assists the senior AOS operator in installing the AOS equipment.
		Assists crewman No. 2 in raising the work platforms and locking them in position.	Assists crewman No. 1 in raising the work platforms and locking them in position.								
											Obtains A_1 from the senior AOS operator. Sights the reference theodolite on the traverse target and sets A_1 on the horizontal circle. Turns the reference theodolite and qualifies with the AOU.
										Operates the AOU in conjunction with the reference theodolite (RT) to determine A_m. Records A_1, A_2 and A_m in the logbook and reports A_1 and A_m to the firing set operator.	Reciprocally lays the AOU with the reference theodolite. Reports A_1 and A_2 to the senior AOS operator.
										Lowers the AOU cover assembly and the AOU pedestal.	

Table II. Assembly

Chief of section	Assistant chief of section	Crewman No. 1	Crewman No. 2	Crewman No. 3	Crewman No. 4	Crewman No. 5	Crewman No. 6 (heavy truck driver)	Boom operator	Senior azimuth orienting system (AOS)	Azimuth orienting system operator	Firing set operator
Gives local data to the FS operator and the senior azimuth orientation system (AOS) operator.											
Supervises operations. Watches for potential safety violations.						Removes the missile assembly tools from the OEM (on equipment materiel), box and places them on the work platforms.			Checks the level of the reference theodolite in the traverse target (TT).	Assists the senior AOS operator.	Performs the preoperational and operational checks on the firing set as outlined in TM 9-1440-301-12.
Directs motor guidance transport trailer into position.	Performs the hoist table inspection.							During assembly operations he operates the superstructure hydraulic system as directed by the assistant chief of section.			
				Assisted by crewman No. 4, he, No. 5, and No. 6, he removes the control surface containers from the MGTT.	Assists crewman No. 5 and No. 6 in removing the control surface containers from the MGTT.	Assists crewman No. 3, No. 4, and No. 6 in removing the control surface containers from the MGTT.	Assists crewman No. 5 in removing the control surface containers from the MGTT and opening them.				
				Assisted by crewman No. 4, he opens the rocket motor container lid and locks it in place.	Assists crewman No. 3 in opening the rocket motor container.	Assists crewman No. 6 in opening the control surface containers, disconnecting the electrical cables, and removing the torque rods from the control surfaces.	Assists crewman No. 5 in opening the control surface containers, disconnecting the electrical cables, and removing the torque rods from the control surface.				
						Assists crewman No. 6 in handling the control surfaces during missile assembly.	Assists crewman No. 5 in handling the control surfaces during missile assembly.				
	Directs the boom over the rocket motor container. Directs the boom operator to raise the lock of the U-frame to the fully extended position if it is not already there.										
	Directs the boom operator to— a. Lower the hoist.							Returns the lock signal.			
				Engages the hoist yoke with the right side of the rocket motor.	Engages the left side of the rocket motor slings with the hoisting yoke.						
	b. Raise the rocket motor until it clears the container.										
Takes rocket motor temperature readings and gives them to the firing set operator.				Releases the nozzle plate from the rocket motor.							
	c. Raise the rocket motor until the hoisting yoke is approximately 6 inches from seating in the trolley.			Guides the front end of the rocket motor.	Guides the rear end of the rocket motor.						
	d. Set the trolley valve to IN until the rocket motor slings are clear of the forward hangars. e. Raise the hoist until it is seated in the trolley; then lock the hoist valve up.										
	f. Engages the rocket motor hooks with the boom hangars. g. Check the HOOK ENGAGED YES light for an ENGAGED YES indication.			Assisted by crewman No. 4, he opens the guidance section container lid and locks it in the open position.	Assists crewman No. 3 in opening the guidance section container.			Returns the lock signal.			
	h. Lock the U-frame in the fire position and position the rocket motor between the work platforms.			Disconnects P028 and P029 from the guidance section.	Disconnects the six electrical cables (P801 through P806).			Returns the OK signal.			
		Verbally directs the boom operator in disengaging the rocket motor slings.						Returns the lock signal.			
		Assists crewman No. 2 in removing the rocket motor slings and hands them to crewman No. 5.	Assists crewman No. 1 in disengaging the rocket motor slings from the hoist yoke.								
	Directs boom operator to position the hoist yoke over the guidance section handling fixture.					Places the rocket motor sling in the empty rocket motor container and safety wires the nozzle plate to the peg.					
				Engages the hoist yoke with the guidance section and handling fixture.	Engages the left side of the hoist yoke with the guidance section handling fixture.	Assists crewman No. 6 to close the rocket motor container.	Assists crewman No. 5 to close the rocket motor container.				
	Insures that the hoist yoke is engaged with the handling fixture.										
	Directs boom operator to— a. Raise the guidance section until it clears the container. b. Stop the hoist until crewmen No. 3 and No. 4 have removed the supports.										
				Removes the guidance section access door and disconnects cable P950.							
				Removes the rear support.	Removes the front support.						
	c. Raise and lock the guidance section 12 to 15 inches from rocket motor. d. Lower and lock the U-frame in the fire position and position the boom between the work platforms. e. Engages the guidance section with rocket motor.							Returns the lock signal.			
		Tightens and torques swing bolts on his side of the guidance section to 1,250 inch-pounds. (850 inch-pounds for training.)	Tightens and torques swing bolts on his side of the guidance section to 1,250 inch-pounds. (850 inch-pounds for training.)								
		Assisted by crewman No. 2, he disengages the guidance section handling fixture and hands it to crewman No. 5.	Assists crewman No. 1 in removing the guidance section handling fixture.								
						Places the guidance section handling fixture in the guidance section container.					
						Assists crewman No. 6 in closing the guidance section container.	Assists crewman No. 5 in closing the guidance section container.				
						Assists crewman No. 6 in closing the control surface containers and securing them to the MGTT.	Assists crewman No. 5 in closing the control surface containers and securing them to the MGTT.				
Directs motor guidance transport trailer (MGTT) from the area.											
Directs warhead transport vehicle into position.											
				Assisted by crewman No. 4, he opens the warhead container lid and locks it in the open position.	Assisted by crewman No. 3, he opens the warhead container lid and locks it in the open position.						
				Disconnects the 7W3 cable (7W2 should already be disconnected) and removes the dust covers.	Disengages the warhead forward and rear tiedown straps.						
				Disengages the green SAFE plug and installs the red FIRE plug.							
	Directs the boom operator to seat the trolley hoist against the forward stop and to position the hoist yoke over the warhead section sling.										
					Engages the hoist yoke with the warhead sling.						
	Insures that the hoist yoke is engaged with the warhead section sling.										
	Directs the boom operator to— a. Raise the warhead section until it clears its container and to wait until crewman No. 3 and No. 4 have completed their operations.			Releases the two swing bolts from the thrust bar and guides the warhead section off the bar and out of the container.							
					Inspects and installs the static tube.						
	b. Raise and position the warhead section along the boom.										
	c. Lock the U-frame in the fire position and position the boom between the work platforms. d. Position the warhead against the guidance section.			Assists crewman No. 4 in installing the control surfaces if they have not already been installed.	Assists crewman No. 3 in installing the control surface assemblies, if they have not already been installed.			Returns the lock signal.			
		Tightens and torques the side and bottom warhead section swing bolts to 1,250 inch-pounds. (850 inch-pounds for training.)	Tightens, then torques the top and side warhead swing bolts to 1,250 inch-pound. (850 inch-pounds for training.)								
	e. Directs the boom operator to run the trolley all the way to the rear. f. Directs the boom operator to fold the boom.	Assists crewman No. 2 to disengage the warhead sling.	Assisted by crewman No. 1, he disengages the warhead sling and hands it to crewman No. 5.						Inserts the AOU into the missile and makes contact with the inductosyn; then plumbs and levels.	Sights on the traverse target with the reference theodolite and places a random reading on the horizontal scale (R_1).	
		Engages the missile electrical breakaway with the breakaway arm and engages the six electrical cables to the connectors on the boom, starting with P801 and ending with P806.				Places the warhead section sling in the warhead container and straps it down.			Sights on the RT and places the random reading on the AOU horizontal scale.	Turns and qualifies the reference theodolite with the AOU. Reports R_1 and R_2 to the senior AOS operator.	
	g. Insures that all electrical connections are made.					Assists crewman No. 6 in closing the warhead container.	Assists crewman No. 5 in closing the warhead section container.		Records random readings R_1, R_2, and R_3 in the logbook and reports them to the firing set operator.		
Directs warhead transport vehicles out of the area.		Assists crewman No. 2 in lowering the left work platform and locking it in the travel position.	Assists crewman No. 1 in lowering and locking the work platforms.								
	Rechecks level and, if necessary, relevels the launching station.										
									Turns the AOU until R_1 shows on the AOU scales. When resetting of R_1 has been completed, he turns the AOU READY LIGHT switch on.		
		Assists chief of section inserting cartridge actuating device.							Prepares the AOU for the missile firing.		
Inserts the cartridge actuating device.											
Assists crewman No. 1 in lowering the right work platform.		Assists the chief of section in lowering the right work platform and locking it in the travel position.									

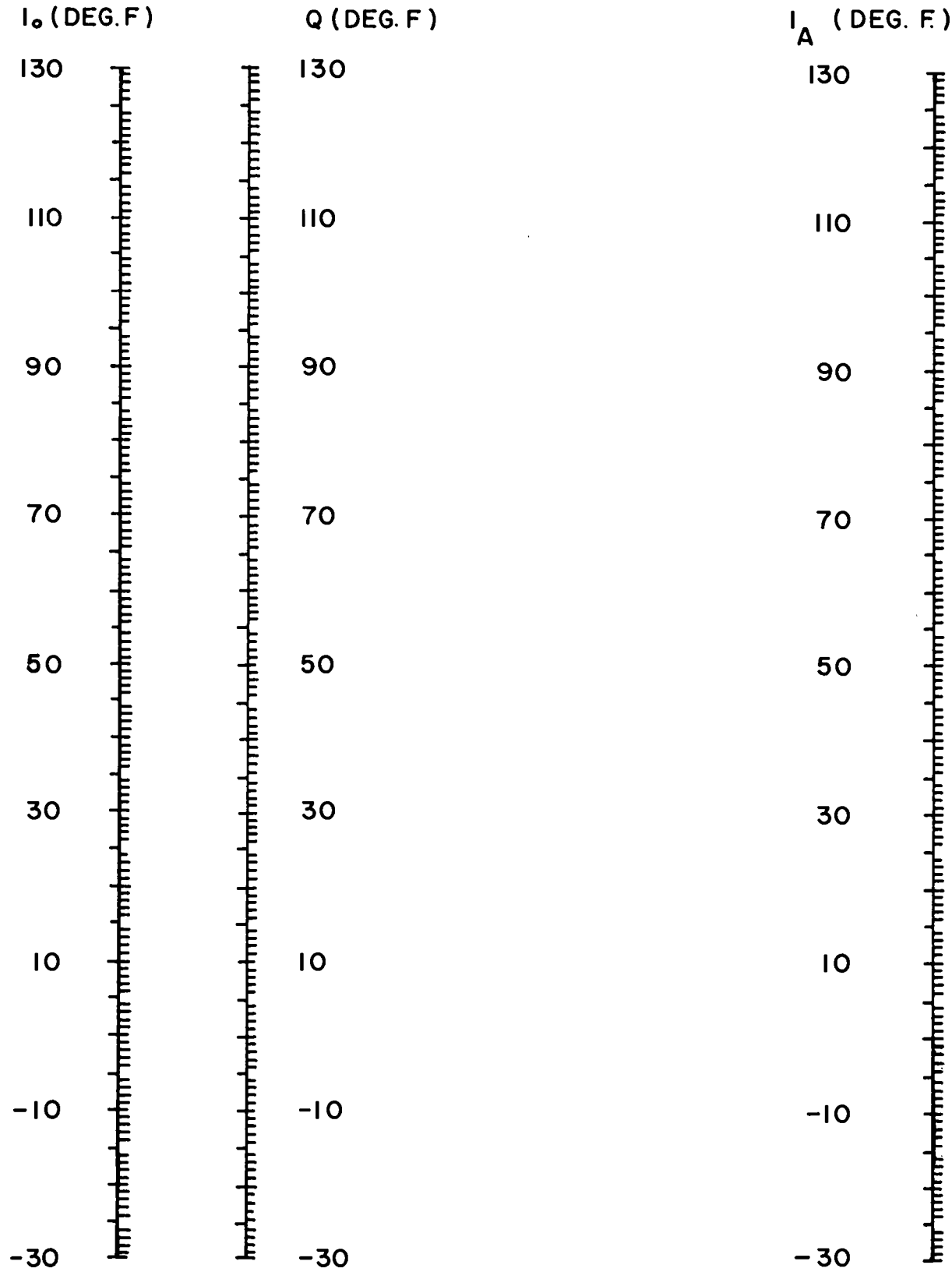
Table III. Disassembly

Chief of section	Assistant chief of section	Crewman No. 1	Crewman No. 2	Crewman No. 3	Crewman No. 4	Crewman No. 5	Crewman No. 6 (heavy truck driver)	Boom operator	Senior azimuth orienting system (AOS)	Azimuth orienting system operator	Firing set operator
Supervises overall operation.		Assists crewman No. 2 in raising the work platforms and locking them in position.	Assists crewman No. 1 in raising the work platforms in position and locking them in place.	Starts the turbine if not already operating.				During the disassembly operations he operates the superstructure as directed by the assistant chief of section.	Lowers the AOU pedestal.		Performs shutdown procedures on the firing set as outlined in TM 9-1440-301-12.
	Directs the senior AOS operator to lower the AOU. Directs the boom operator to remove the missile from the firing elevation and centers it over the work platforms.								Removes the AOU from its pedestal and returns it to its container.		Insures that the firing set power switches are in the OFF positions.
		Opens the guidance section access door, disengages the rocket motor breech, removes the cartridge actuating device.									Marsh orders the cable reel assembly (remote firing box) and secures it to the firing set door.
Directs warhead transport vehicle into position.		Assists the chief of section in placing the cartridge actuating device in its plastic container.							Assists the AOS operator in disassembling and securing all AOS equipment.	Assists the senior AOS operator in disassembling and securing all AOS equipment.	Closes all vent doors.
	Insures that both systems of the firing set are reset and that both TEST OPERATE switches are in the TEST position.					Assists crewman No. 6 in removing the control surface containers from the MGTT and opening them.	Assists crewman No. 5 in removing the control surface containers from the MGTT and opening them.				
		Disconnects the six electrical cables from the boom, starting with P806, and disconnects the breakaway arm.	Disengages the A-frame from the missile if necessary.								Closes the firing set door and folds up and locks the firing set platform in the travel position.
	Directs the boom operator to unfold the boom.			Removes control surfaces from the motor.	Assists crewman No. 3 in removing the control surface assemblies.	Assists in removing the control surfaces from the missile, recabling the control surfaces. Installing the torque rods, replacing the control surfaces in their containers.	Assists in removing the control surfaces from the missile, recabling the control surfaces. Installing the torque rods, replacing the control surfaces in their containers.				
				Assisted by crewman No. 4, he opens the warhead container and locks it in the open position.	Assists crewman No. 3 in opening the warhead container.						
				Hands the warhead slings to crewman No. 2.							
		Assists crewman No. 2 in installing the warhead sling.	Receives the warhead sling from crewman No. 3, and, assisted by crewman No. 1, secures it to the warhead.								
	Insures that the warhead sling is secured to the warhead.										
	Directs the boom operator to position the trolley over the warhead sling.										
		Engages the hoist yoke with the warhead sling.									
		Loosens the side swing bolt, then the top swing bolt.	Loosens and disengages the bottom and side warhead swing bolts.								
	Directs the boom operator to lock the hoist in the UP position.										
	Directs the boom operator to — a. Position the trolley against the forward stop in order to disengage the warhead from the guidance section. b. Position the boom and warhead over the warhead container.							Returns the lock signal.			
	c. Lower the warhead until crewman No. 3 can place the swing bolts into the engagement slots on the thrust bar of the warhead container and crewman No. 4 can remove the static tube. (Crewman No. 4 releases the trolley hoist.)			Guides the rear of the warhead and positions the swing bolts into the engagement slots on the thrust bar.	Disconnects the static tube and returns it to its container.						
				Removes the red FIRE plug and installs the green SAFE plug.	Disengages the hoist yoke from the warhead section sling.						
	d. Seat the hoist into the trolley. e. Center the boom between the work platforms.					Replaces the TW3 cable, replaces the dust caps on exposed connectors and tapes down the swing bolts of the warhead section.					
						Assists crewman No. 6 in closing the warhead section container.	Assists crewman No. 5 in closing the warhead section container.				
Directs warhead transport vehicle out of the area.											
Directs motor guidance transport trailer into position.											
				Assisted by crewman No. 4 he opens the guidance section container and locks the lid open.	Assists crewman No. 3 in opening the guidance section container.						
				Hands the guidance section handling fixture to crewman No. 1.							
		Receives the guidance section handling fixture from crewman No. 3 and, assisted by crewman No. 2, attaches it to the guidance section.	Assists crewman No. 1 with the guidance section handling fixture.								
	Directs the boom operator to position the trolley over the handling fixture and lower the hoist to engage the handling fixture and then lock the hoist to the trolley.	Engages the hoist yoke to the guidance section handling fixture.									
	Directs crewman No. 1 to disconnect the electrical cables between guidance section and motor.							Returns the lock signal.			
		Opens the guidance section access door and disconnects the three electrical cables from the rocket motor.									
	Directs crewman No. 1 and No. 2 to loosen the guidance section swing bolts.										
		Loosens and disengages the swing bolts on his side of the missile, starting with the lower bolt.	Loosens and disengages the guidance section swing bolts on his side of the missile.								
	Directs boom operator to — a. Disengage the guidance section from the rocket motor. b. Lock the u-frame in the fire position and center the boom over the guidance section container.										
	c. Lower the guidance section until crewman No. 3 and No. 4 can install the supports.							Returns the lock signal.			
				Installs the rear support. Removes the guidance section access door, connects cable P050 to its connector on the rear support, and replaces the access door.	Installs the forward support.						
	d. Lower the guidance section into the container.			Guides the guidance section into the container.	Guides the front of the guidance section.						
	Insures that the hoisting yoke is disengaged from the handling fixture.					Connects P801 through P806 to the container, connects P050 to the rear support, and installs the t-bolt.					
	Directs the boom operator to — a. Raise the hoist until it is engaged with the trolley. b. Lock the u-frame in the fire position and center the boom over the work platforms.			Opens the rocket motor container and hands crewman No. 1 the rocket motor slings.	Assists crewman No. 3 in opening the rocket motor container.	Assists crewman No. 6 in closing the guidance section container.	Assists crewman No. 5 in closing the guidance section container.				
	c. Lock the u-frame in the fully extended position.						Returns the lock signal.				
		Receives the rocket motor slings from crewman No. 3, and, assisted by crewman No. 2, installs the slings.	Assists crewman No. 1 in installing the rocket motor slings.				Returns the lock signal.				
		Verbally directs the boom operator to position the trolley over the rocket motor slings and lower the hoist.									
		Assists crewman No. 2 in engaging the slings with the hoist yoke.	Assists crewman No. 1 in engaging the rocket motor slings with the hoist yoke.								
		Directs the boom operator to lock the hoist to the trolley.									
	Insures that the hoist is securely attached to the slings.										
	Directs the boom operator to — a. Lock the u-frame in the fire position.										
	b. Position the rocket motor over the container. c. Lock the u-frame in the fully-extended position.						Returns the lock signal.				
	d. Disengage the hook latch pin and at the same time move the trolley forward approximately 1 foot to disengage the rocket motor from the hangars. e. Lower the rocket motor until the hoist clears the front rocket motor hangars. f. Position the rocket motor over the rocket motor container. g. Lower the rocket motor until crewman No. 3 can attach the rear nozzle plate.						Returns the lock signal.				
				Installs the nozzle retaining plate and the retainer clamp.							
	h. Lower the rocket motor into the container.			Guides the rear of the rocket motor into the motor container.	Guides the forward end of the rocket motor into the container.						
				Disengages the hoisting yoke from the rocket motor.	Assists crewman No. 3 in disengaging the hoisting yoke from the rocket motor.						
	Insures that the hoisting yoke has been disengaged from the rocket motor slings.										
	Directs the boom operator to raise the hoist until it is engaged with the trolley.					Insures that the two cartridge actuating devices are installed in their receptacles in the rocket motor container.					
						Assists crewman No. 6 in closing the rocket motor container.	Assists crewman No. 5 in closing the rocket motor container.				
				Assists crewman No. 5 and No. 6 in returning the control surface containers to the MGTT.	Assists crewman No. 5 and No. 6 in returning the control surface containers to the MGTT.	Assists crewman No. 6 in returning the control surface containers to the MGTT.	Assists crewman No. 5 in returning the control surface containers to the MGTT.				
						Replaces the assembly tools in the OEM tool box.					

Table IV. March Order

Chief of section	Assistant chief of section	Crewman No. 1	Crewman No. 2	Crewman No. 3	Crewman No. 4	Crewman No. 5	Crewman No. 6 (heavy truck driver)	Boom operator	Senior azimuth orienting system (AOS)	Azimuth orienting system operator	Firing set operator
				On direction from the assistant chief of section, starts the GTCS if it is not already in operation.							
	Directs the boom operator to — a. Move the trolley to the rear stop on the boom. b. Position the boom over the firing set. c. Fold the boom.	Assisted by crewman No. 2, he insures that the work platforms are locked in the travel position.	Insures that the work platforms are locked in travel position.					Operates the superstructure hydraulic system as directed by the assistant chief of section.	Insures that all AOS equipment is properly stored and locked in the travel position.	Assists the senior AOS operator in disassembling and securing all AOS equipment.	
	Signals crewman No. 1 and No. 2 to unlock the U-frame actuators.	Unlocks the right frame actuator.	Unlocks the left frame actuator.		Insures that all containers are locked in their travel positions on the rear of the launcher.		Drives the launching station prime mover into the area.				
	Directs the boom operator to lower the superstructure to the travel position and turn off the superstructure pump motors.										
	Checks the trailer control panel lights.							Turns off the superstructure pump motors.			
	Turns on the semitrailer hydraulic system.							Insures that the controls are in their normal preoperating positions.			
Directs crewman No. 6 to position prime mover.	Retracts the rear jack to full-up position.						Positions the launching station prime mover.				
Directs assistant chief of section to extend the outriggers until the fifth wheel plate can be engaged with the fifth wheel of the prime mover.					Engages the rear jack travel latch.						
	Raises the blast shield.										
	Operates the two-outrigger jacks to raise the semitrailer so that the trailer fifth wheel pin can engage the tractor fifth wheel plate.				Locks the rear jack pad in its travel position.			Engages the blast shield travel locks.			
Directs crewman No. 6 to engage launching station fifth wheel pin with tractor fifth wheel plate.											
							Engages the fifth wheel pin with the tractor fifth wheel plate.				
	Retracts both outrigger jacks to their full-up positions.										
	Turns off the trailer hydraulic system. Signals crewman No. 3 to turn off the GTCS.	Assisted by crewman No. 3, he returns the right outrigger jack pad to its travel position and locks it in place.	Assisted by crewman No. 4, he returns the left outrigger jack pad to its travel position and locks it in place.	Assisted by crewman No. 3, he returns the right outrigger jack pad to its travel position and locks it in place.	Assisted by crewman No. 4, he returns the left outrigger to the travel position and locks it in place.						
Directs FS operator to couple air and electrical cables to launching station.				On signal from the assistant chief of section, turns off the GTCS.							
	Directs crewman No. 4 to disconnect the grounding cable from the grounding stake.			Closes the main fuel shutoff valve.							Makes all intervehicular cable and airhose connections.
											Turns on the air for the launcher trailer brakes.
Inspects the launching station to insure that it is secure and that all equipment is accounted for.						Drives the personnel vehicle to the launcher and loads the crew.					

Table V. Nomograph for Rocket Motor Q Temperature



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